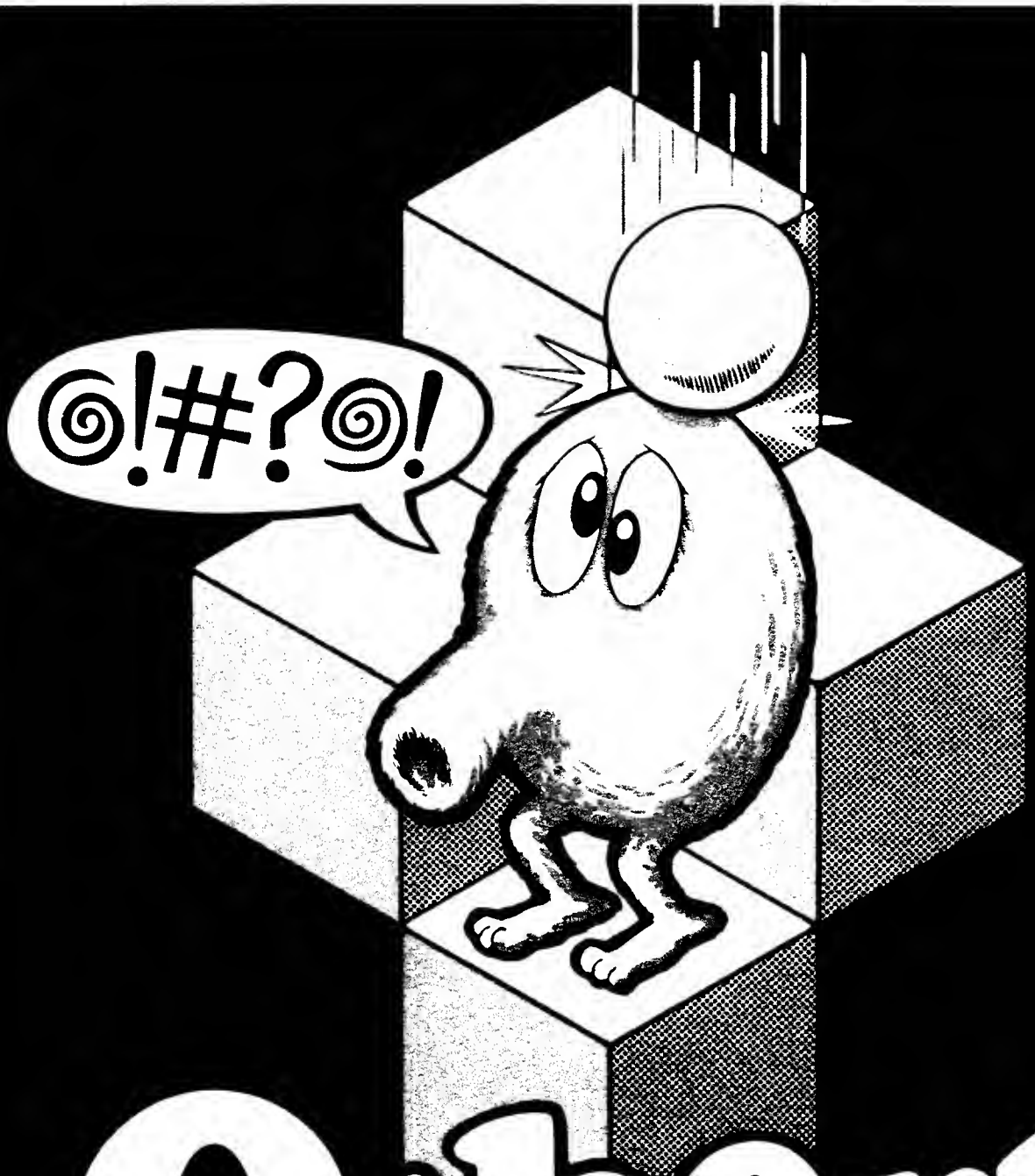


Q*bert T.M.

Instruction Manual

Gottlieb
AMUSEMENT GAMES
165 W. Lake Street Northlake, IL 60164
(312) 562-7400 Telex 72-8463
A Columbia Pictures Industries Company

Q*BERT (GAME GV-103A)
INSTRUCTION MANUAL

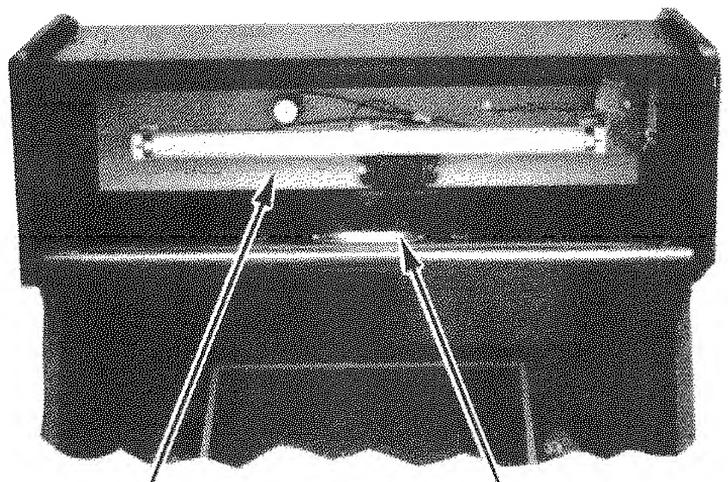
TABLE OF CONTENTS

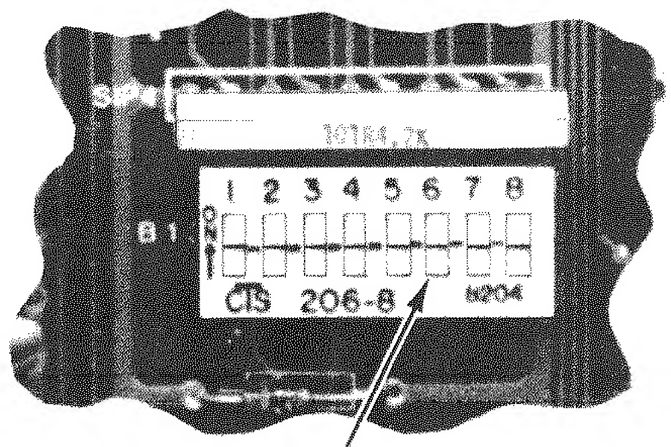
NOTICE

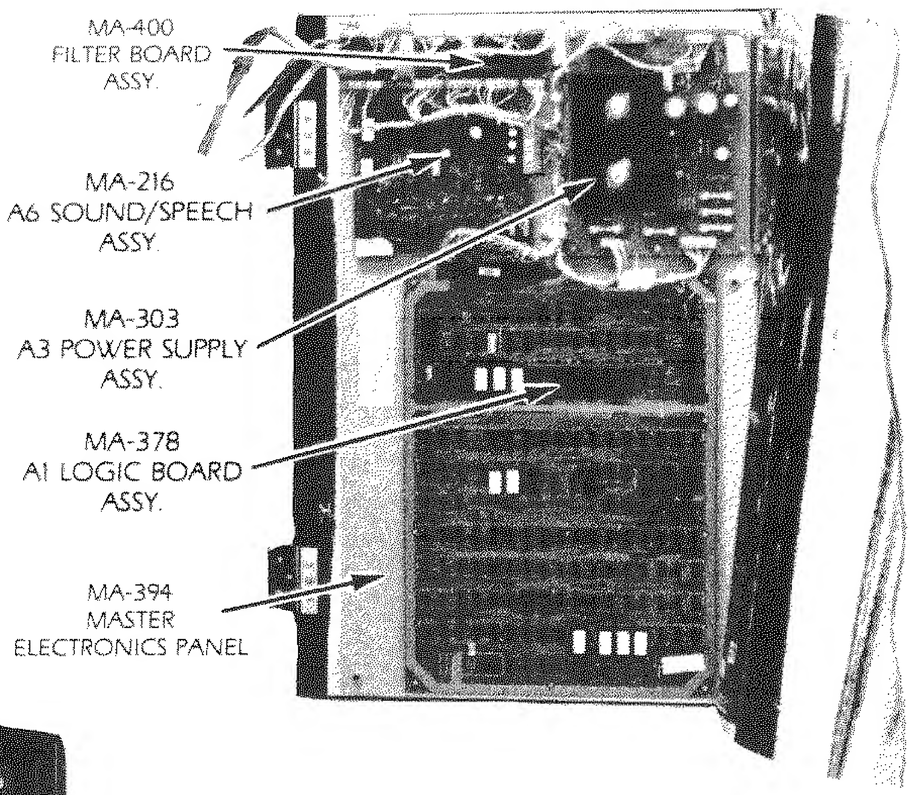
WARRANTY INFORMATION IS LOCATED ON THE INSIDE BACK COVER.

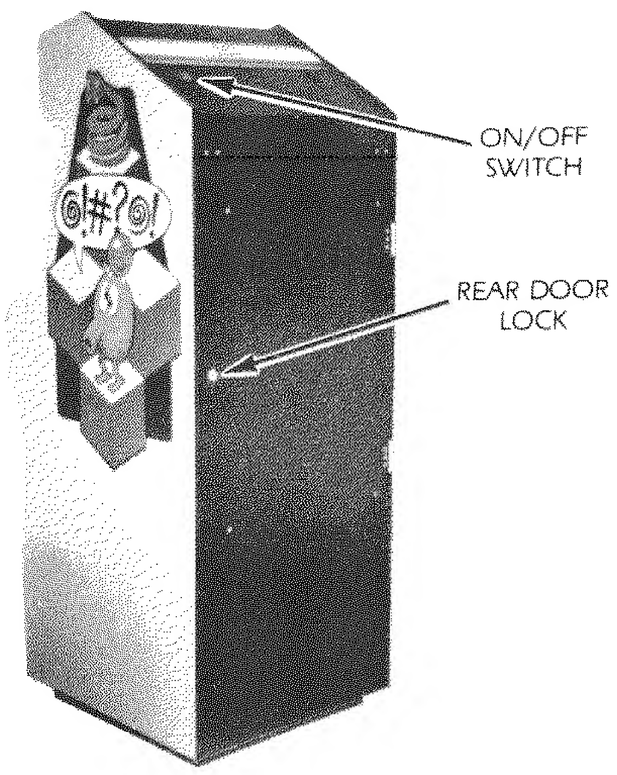
FOR SERVICE, CALL TOLL FREE: 1-800-323-9121; (ILLINOIS) 1-800-942-1620

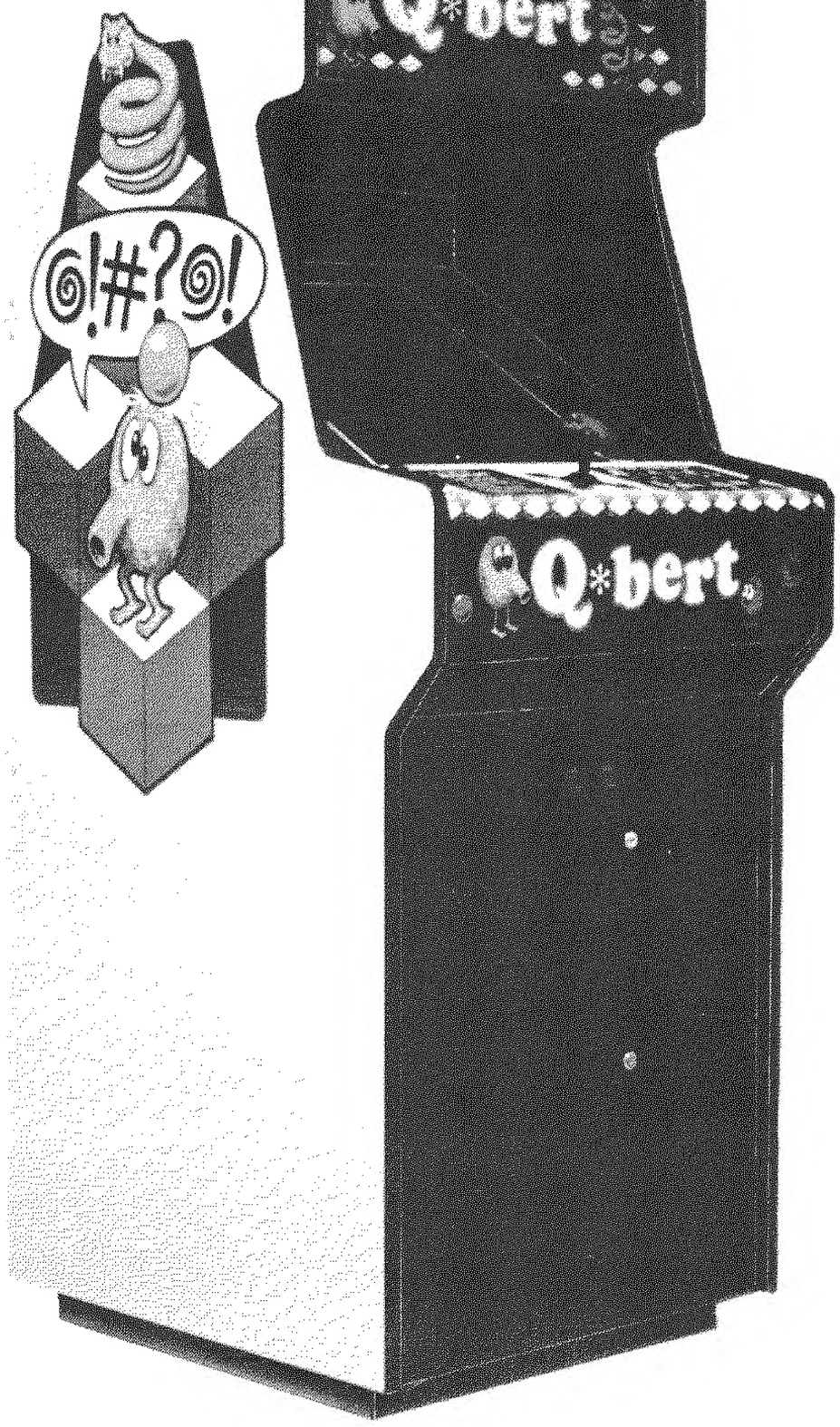
I. INSTALLATION

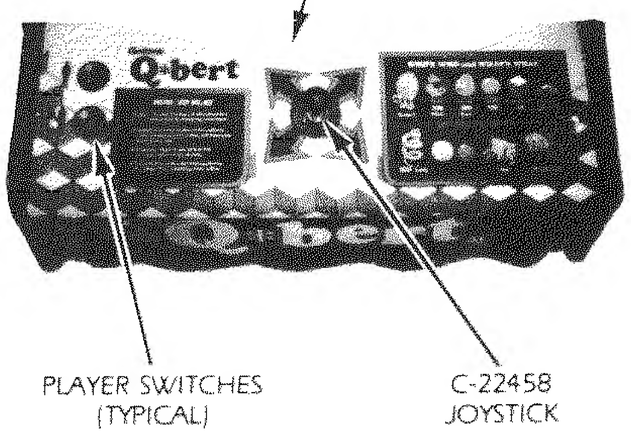


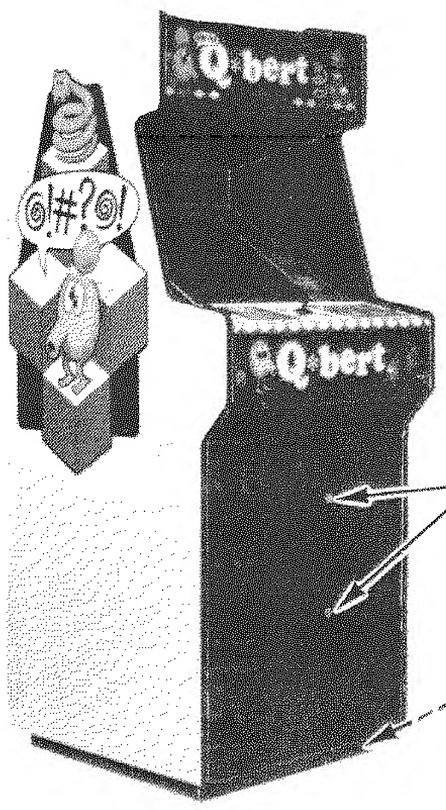


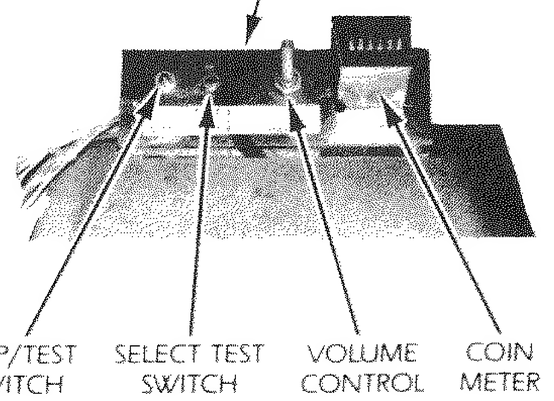


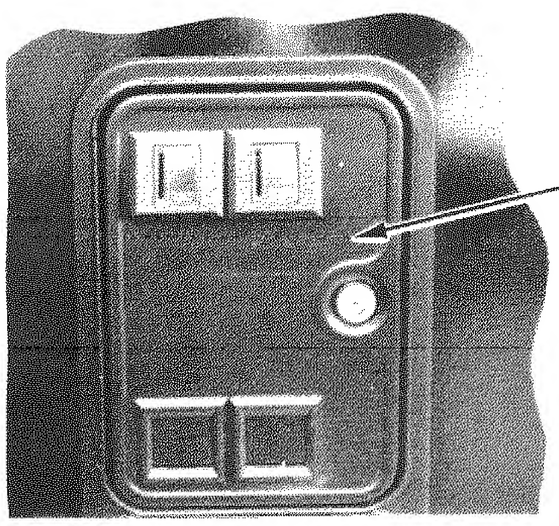


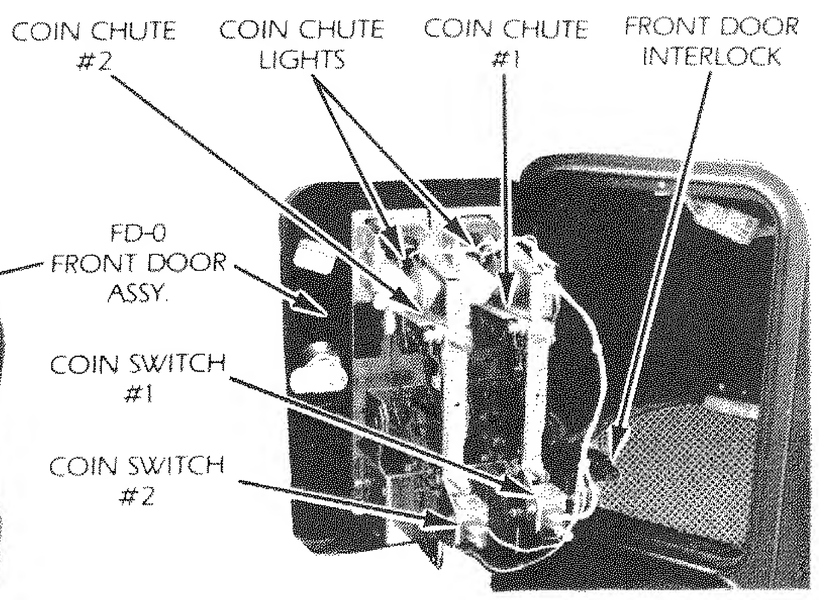


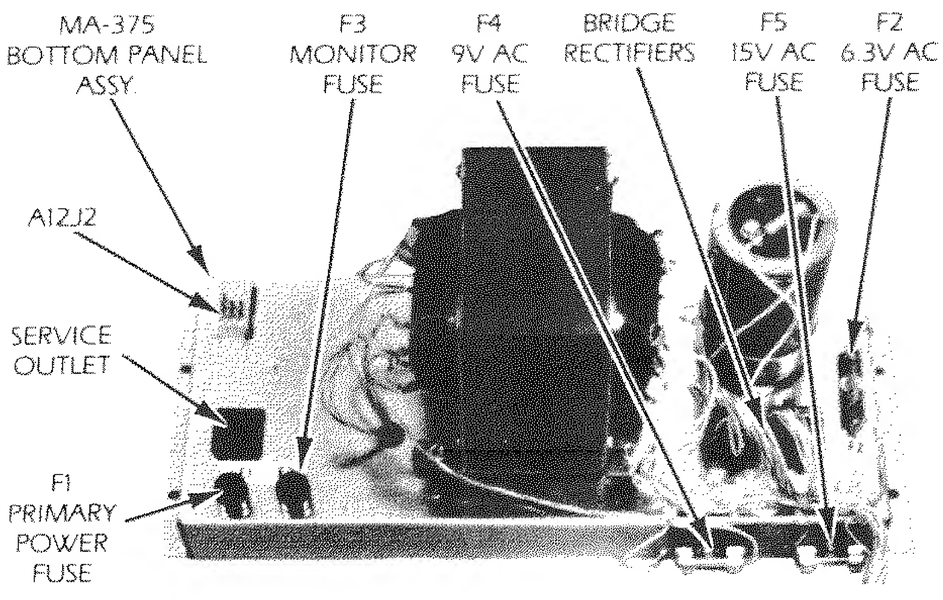








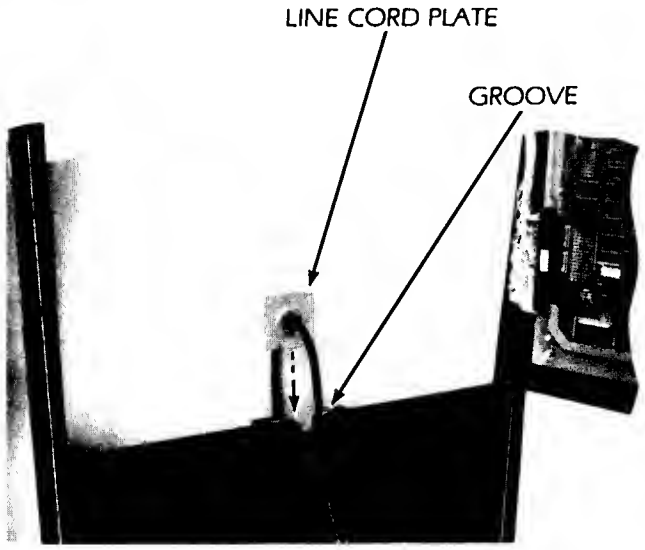




I. INSTALLATION

A. SET—UP

1. Carefully inspect the exterior of the game for any damage which might have occurred during shipment.
2. Unlock and open the rear cabinet door.
3. Check that all plug in connectors are seated firmly. The connectors are keyed so they will only go in one way.
4. Remove the binding strap from the line cord, and install the line cord plate in the groove provided (see photo).
5. Cabinet levelers (2) are stored within the cash box for shipping purposes. Install and adjust as necessary.



B. CHECK-OUT

1. Check that all cables are free of moving parts.
2. Check for any loose wires.
3. Check for loose solder or foreign matter on switches and power supply assemblies.
4. Be certain all fuses are seated firmly.
5. Be sure transformer wiring corresponds to the supply voltage.
6. Refer to section VI to make all the necessary game adjustments.
7. Reassemble the game.
8. Plug the line cord into a properly grounded 3-wire receptacle ONLY!!

C. CONTROL PANEL REMOVAL

1. Unplug the game.
2. Unlock and open the coin chute door.
3. Reach in through the coin chute door and remove the wing nut and flat washer from each of the two carriage bolts which secure the control panel to the game. Remove the carriage bolts.
4. Pull the control panel back, grasp it at the front edge as far back as it will go (approximately ¼").
5. Raise the front of the control panel approximately one inch above its supports and lift the entire assembly high enough to disconnect plug A9J2/A9P2.
6. Remove the entire control panel assembly from the game.
7. The Joystick and leaf-switches are now accessible for removal or cleaning.

D. MONITOR REMOVAL

1. Unplug the game.
2. Perform the control panel assembly removal procedure (Section C).
3. Remove the outside shield, glass and monitor mask and put them aside in a secure place.
4. Unlock and open the rear cabinet door.
5. NOTE: The color monitor contains HIGH VOLTAGES delivering LETHAL quantities of energy. Do not attempt to service the monitor until you have shorted the anode plug on the picture tube to ground.
6. Disconnect the video plug A17J1, the monitor power supply plug A12J3/A12P3 and the ground wire from the monitor chassis.
7. From the rear of the game, remove the one nut and one washer from each of the four carriage bolts used to secure the monitor to the platform.
8. Remove the monitor from the rear of the game, being careful to clear all cables from the CRT neck.
9. For reassembly, reverse the above procedure.

II. INITIALIZATION, III. GAME OPERATION

II. INITIALIZATION

TURN GAME ON

Immediately, the coin chute lamps and the speaker marquee lamp will turn on.

AFTER A TEN SECOND DELAY

A. The attract mode appears on the screen.

B. The playing field cycles through the follow

1. High Game to Date screen
2. Instruction Set
3. Game Play Cycle

III. GAME OPERATION

A. GAME START

1. Insert coins into coin chute.
   a. Coin chute tune is played.
   b. Total credits are displayed on screen.
2. Press one or two player button to start game.
   a. Demonstration scene displayed on screen.
   b. Total Credits are decreased by one.
   c. Game initializes.

B. FIRST PLAYER

1. The first player's score displays a zero.
2. The other player's display will be blank.

C. SECOND PLAYER

1. Additional player is indicated by the words "PLAYER 2" and a zero in the second player's display.

D. "Q*BERTS"/EXTRA "Q*BERTS"

1. Each player will begin with three "Q*Bert" lives. (Dependent on Option/Parameter settings.)
2. Extra "Q*Berts" are earned by achieving certain score levels. (Dependent on Option/Parameter settings.)

IV. GAME PLAY AND SCORING

HOW TO PLAY

The object of the "Q*Bert" game is to change the color of the top of the cubes to the designated color by hopping onto them. When all the cubes in the pyramid have been changed to the designated color, the screen will advance to the next Round, with "Q*Bert" starting back on the top cube. At the beginning of each Level, there will be a short demonstration cycle with the "Q*Bert" character hopping around four cubes to explain to the player the play action of each Level. Each Level consists of four Rounds.

The game play starts with the player-controlled "Q*Bert" character appearing at the top of the pyramid. The joystick will move "Q*Bert" from cube to cube by hopping in any of four diagonal directions. "Q*Bert" can move anywhere on the pyramid, but jumping off will kill him. Hopping on the rotating disk will take "Q*Bert" back to the top of the pyramid. In the first two Rounds "Q*Bert" will have to avoid touching the red and purple balls. These deadly objects drop randomly onto the second-from-the-top level and bounce downwards. The red balls will fall off the bottom but the purple ball will stop at the bottom and hatch into "Coily", the snake which chases "Q*Bert". To destroy the snake, lure him to the edge, then jump unto a disk. The disk will take "Q*Bert" back to the top and "Coily" will fall off, awarding 500 points.

Starting at the third Round, other characters come into play. The green characters or objects are safe to hop onto and will award points. All other objects are deadly to touch. In the third Round the red balls will stop falling, but two purple characters, "Ugg" and "Wrong-Way", will appear at the lower portion of the pyramid and travel sideways and upwards. They will not chase "Q*Bert" but will move randomly to get in "Q*Bert's" way. In the third Round and every Round after, based on an internal timer, a green ball will appear and bounce down from the top of the pyramid. Hopping "Q*Bert" onto the green ball will award 100 points, and freeze all the characters on the screen for a few seconds, but "Q*Bert" will still be able to move to complete the color changes.

During the third Round of play, two green characters, "Slick" and "Sam", will appear, based on the internal timer. They will drop onto the second level from the top and hop randomly downwards. If they hop onto a cube that "Q*Bert" has already changed the color of, the cube will change to a different color, to thwart "Q*Bert". Hopping "Q*Bert" onto "Slick" or "Sam" will stop them and award 300 points.

Throughout the remaining Rounds, all the characters and objects will appear in random combinations with increasing speed.

To add variety to the game, the disks will change positions every Round, and in the higher Levels the number of disks will change. (See Round Progression Chart.)

During Level Two, the play action will increase in difficulty from changing the cubes to one color, to changing the color of the cubes twice. This means that each cube would have to be hopped on twice to change the pyramid to the designated color, completing the Round.

Starting at Level Three and for all remaining Rounds, and Levels, the play action will become more difficult. The object remains to change the cubes to the designated color, but if "Q*Bert" hops on any cube, that cube will change color. So even if the cube has been changed to the designated color, it will change again.

There are also Bonus points awarded at the end of each Round for successfully completing the Round. The Bonus for the completion of the First Round is 1,000 points. This Bonus will progressively increase each Round by 250 points to a maximum of 5,000 points at Level Five.

CONTROL PANEL INSTRUCTIONS

Goal: Change the tops of all cubes to a new color by hopping onto them.

- Joystick moves "Q*Bert" from cube to cube. Hopping onto a disk will take you back to the top.
- All green objects are safe to hit. All other objects are deadly.
- Destroy the snake by leading him to the edge, then jumping on a disk.
- Stay on pyramid! Only jump off to use a disk.

IV. GAME PLAY AND SCORING

ROUND PROGRESSIONS

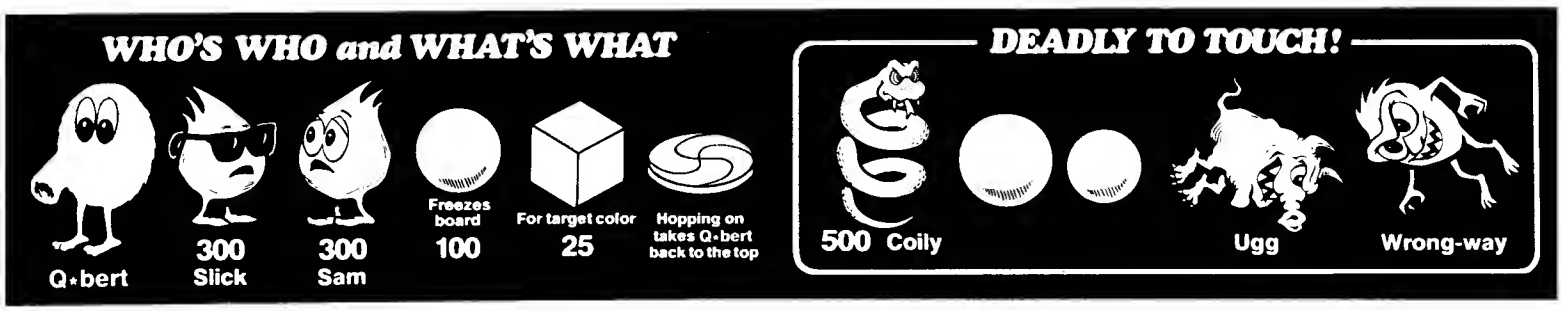
The following chart lists round progressions for "Q*Bert".

Commencing with Level V all characters will appear in each subsequent round. The number of disks and the Round Completion Bonus will remain the same value for the rest of the game. The characters and play action will gain more speed with each increased level of play.

	ROUND	DISKS	CHARACTERS ON SCREEN	ROUND COMPLETION BONUS
LEVEL I	1	2	Red Balls, Coily	1000
	2	2	Red Balls, Coily	1250
	3	2	Coily, Green Ball, Ugg/Wrong way, Slick/Sam	1500
	4	2	Red Balls, Coily, Green Ball, Slick/Sam	1750
LEVEL II	1	3	Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	2000
	2	3	Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	2250
	3	2	Red Balls, Coily, Green Ball, Slick/Sam	2500
	4	2	Red Balls, Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	2750
LEVEL III	1	4	Red Balls, Coily, Green Ball, Slick/Sam	3000
	2	4	Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	3250
	3	3	Red Balls, Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	3500
	4	3	Red Balls, Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	3750
LEVEL IV	1	6	Red Balls, Coily, Green Ball, Slick/Sam	4000
	2	6	Red Balls, Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	4250
	3	5	Red Balls, Coily, Green Ball, Slick/Sam	4500
	4	4	Red Balls, Coily, Green Ball, Ugg/Wrong Way, Slick/Sam	4750
LEVEL V	1	7	In Level V all characters will appear in each Round	4750
	2	6		5000
	3	6		5000
	4	5		5000
LEVEL VI THRU LEVEL IX	1	5	All characters will appear in each Round in Level VI thru Level IX	5000
	2	5		5000
	3	5		5000
	4	5		5000

SCORING

- Luring "Coily" off the edge
  Scores 500 points and clears pyramid of characters
- Hopping onto "Slick" or "Sam"
  Scores 300 points
- Hopping onto Green Ball
  Scores 100 points and freezes characters but not "Q*Bert"
- Changing cubes to designated color
  Scores 25 points
- Changing cubes to intermediate color (in Level II or Up)
  Scores 15 points
- Unused disks
  Scores 50 points
- Round Completion Bonus
  See Round Progression Chart



V. SOUND/SPEECH, VI. GAME ADJUSTMENTS/OPTIONS

V. SOUND/SPEECH

ATTRACT MODE

SPEECH	OCCURENCE
"HELLO, I'M TURNED ON"	When game is powered up.

GAME MODE

SPEECH	OCCURENCE
(Garbled Nonsense Speech)	When "Q*Bert" is killed. When the characters "Slick/Sam" and "Ugg/Wrong Way" are present.
"BYE, BYE"	When player has finished entering his initials on high score table.

VI. GAME ADJUSTMENTS/OPTIONS

A. CONTROL BOARD SWITCH ADJUSTMENTS

SWITCH 1 ____ DEMONSTRATION MODE*
ON ..... INFINITE LIVES
OFF ..... NORMAL PLAY

SWITCH 2 ____ ATTRACT PLAY
ON ..... NO SOUND
OFF ..... SOUND

SWITCH 3 ____ NORMAL/FREE
ON ..... FREE PLAY
OFF ..... NORMAL GAME

SWITCH 4 ____ GAME MODE
ON ..... COCKTAIL
OFF ..... UPRIGHT

SWITCH 5 ____ NOT USED

SWITCH 6 ____ KICKER
ON ..... KICKER ON
OFF ..... KICKER OFF

SWITCH 7 ____ NOT USED

SWITCH 8 ____ NOT USED

*IN DEMONSTRATION MODE THE PLAYER WILL HAVE INFINITE LIVES AND CAN PROGRESS THROUGH THE ROUNDS BY HITTING EITHER START BUTTON.

B. SOUND ADJUSTMENTS

The audio output is controlled by the potentiometer mounted on the service panel assembly (located inside the coin mechanism door).

Turning the potentiometer counter-clockwise will decrease the volume. Turning it clockwise will increase the volume.

IMPORTANT: Each of the potentiometers installed on the Sound/Speech board have been factory adjusted. The potentiometer settings should never be changed when performing the recommended calibration procedure.

C. MONITOR ADJUSTMENTS

Normally, few if any adjustments are required for proper monitor operation. However, after any major repairs to the monitor chassis refer to the attached monitor manual.

VII. BOOKKEEPING AND SELF TEST

BOOKKEEPING

The battery back-up bookkeeping functions of Q*Bert (GV-103) are contained in Self Test steps 3 and 4. These are in addition to the electro-mechanical coin counter located inside the front door panel. Every time a coin is inserted into a coin slot, the counter is energized, incrementing the count.

SELF TEST

The self-test consists of six functions which may be used to identify problems in the video system and to change program parameters.

The self-test mode is entered by setting the self-test toggle switch located inside the cash door to "TEST". A selection of available tests is displayed on the monitor. To return to the GAME mode at any time, the operator needs only to set the toggle switch back to "GAME".

Selection of tests is done with the push button switch labled "SELECT". Upon entering the test mode, a flashing arrow points to the first test selection. Momentarily depressing the "SELECT" button will advance through each selection one by one.

When the arrow is pointing to the desired test, the operator may begin that test by pressing the "SELECT" button and holding it down until the test appears on the screen.

Once a test has been selected, the operator can return to the selection list by holding down the select switch until it re-appears. The eight tests are as follows:

1. MONITOR ADJUSTMENT

Four patterns can be displayed on the screen for adjusting monitor color, brightness, contrast and convergence. The patterns are: Color bars, a cross-hatch, a gray scale, and a dot pattern. By momentarily pressing the select switch, the operator may cycle through the four patterns.

2. DIP SWITCHES

A functional description of the eight Dip Switches located on the Logic Board Assy. is displayed. Changing any switch will cause an immediate update of the description displayed on the screen.

3. DISTRIBUTIONS

Selecting this test will first display a distribution option. The distributions can be reset to zero by pressing either start button, and then pressing the SELECT button momentarily. Following the latter, a cleared distribution screen will be displayed; or the distribution screen can be viewed without clearing it by pressing the SELECT button momentarily when in this test mode. The distribution screen will show three categories of counts — 1) Level/Round; 2) Time; 3) Score. These categories, used with the coin meter count, can be used to derive the game percentages and averages.

The categories are presented in three vertical pairs of columns displaying the level of category and the number of players to attain that level. The left category is a list of the Levels and Rounds up to Level 3, Round 4. Next to each Level/Round is the number of players to reach that Level/Round. The middle two columns are a list of game durations in 45 second increments and the number of players to last that long next to it. The right two columns are a category of players scores in increments of 3000 points and the number of players to attain that score level.

At the bottom of each category will be displayed the number of players to go beyond the defined levels. The number of players in each category level are independent of the other categories, so each player will be listed once each for Level, Time and Score. The number of players in each category level are given in 4 digit values only, so the distribution table should be reset every two weeks or so to insure that meaningful information will be contained in it.

4. OPTIONS/PARAMETERS

This test will allow the operator to view and change all game options on one screen. During this test the screen will display seven operator adjustable options. Pressing the "SELECT" button momentarily will advance the arrow to the next option desired. When the arrow is pointing to the appropriate option, the

operator can then adjust that option by pressing either of the control panel start buttons, to select the desired value for each option.

A. Reset High Score Table — Pressing either start button will reset all 23 high scores to random values and initials starting at 3000 points for No. 1.

B. Factory Preset — Using this option will reset all the following options to the factory recommended levels: 1 Coin/1 Credit, 3 Lives, Normal Difficulty, 1st Extra Life at 8000 Points, Each additional life at each subsequent 14000 Points.

C. Coin/Credit Combinations — Pressing either Start button will cycle thru three coin combinations:
   1) 1 coin = 1 play
   2) 1 coin = 2 play
   3) 2 coin = 1 play

D. Lives Per Game — Pressing either Start button will cycle thru three choices; 3 Lives Per Game, 4 Lives Per Game, 5 Lives Per Game.

E. Difficulty — Two choices may be selected with either Start button; Normal or Hard.

F. 1st Extra Life — There are six choices, from 6000 Points to 11000 Points, that will be displayed by pressing either Start button. Any value can be chosen to award the first extra life by stopping on that choice and then selecting the next option.

G. Each Additional Life — There are six choices, from 12000 Points to 17000 Points, that will cycle thru by pressing either Start button. Any value can be selected to award additional lives at each subsequent Point level chosen.

5. MEMORY

For each RAM memory chip; a green check (✓) or red (x) appears signaling that the chip is good or bad respectively.

For each ROM memory chip, a check sum is displayed. If you have a suspect ROM, refer to your distributor for the correct check sum number.

6. SWITCHES

A colored square is displayed for each player button. Pressing a button causes the appropriate square to change color. For each coin mechanism, a digit is displayed (initially 0). Inserting a coin into a coin chute will increment the appropriate value without affecting the coin meter.

7. SOUND TEST

After selecting this test a count will appear on the screen representing the various sounds that are produced by the Q*Bert game. There will be 36 different sounds produced and the screen count will stop at 41. Pressing either Start button will suppress all sound output and speed up the count so a particular sound can be sought out and checked.

Note: The count on the screen represents the binary signal code that will be sent to the A6 Sound/Speech board through the six sound input lines on the A6J1 connector. When executing the Sound Test sequence, there will be no sounds produced on counts 16, 29, 30, 31 and 32. There are no sounds assigned to these numbers.

8. OBJECT PRIORITY

Visual inspection must be used to determine the priority of two or more objects occupying the same area of the screen; that is, which objects appear to be in front of others and which are behind.

A total of 62 identical objects are placed on the screen in 4 rows. Each object overlaps another such that the first object appears to be in front, and succeeding objects appear to be placed behind all previous ones. When this display is completed, the procedure is repeated such that each new object appears to be in front of all the previous ones.

VIII. GENERAL INFORMATION

A. PRINTED CIRCUIT BOARDS ARE DESIGNATED AS FOLLOWS:

A1 Logic Board Assy.

A3 Power Supply Assy.

A6 Sound/Speech Assy.

A8 Filter Board

B. WIRE COLORS ARE SHOWN AS NUMBERS:

0 Black	5 Green
1 Brown	6 Blue
2 Red	7 Purple
3 Orange	8 Slate
4 Yellow	9 White

For example, 688 is a BLUE- SLATE-SLATE striped wire.

C. FUSES

BOTTOM PANEL

F1	Primary Power		4 Amp SLO-BLO
F2	6.3 VAC		3 Amp SLO-BLO
F3	Monitor		2 Amp SLO-BLO
F4	9 VAC		10 Amp SLO-BLO
F5	15 VAC		1 Amp SLO-BLO
F6	Knocker	+30VDC	1 Amp SLO-BLO

POWER SUPPLY ASSY. (A3)

F11	+5VDC Source		5 Amp SLO-BLO
F21	Sound/Speech Assy.	+30VDC	1½ Amp SLO-BLO
F31	Sound/Speech Assy.	+12VDC	¼ Amp SLO-BLO
F32	Sound/Speech Assy.	-12VDC	¼ Amp SLO-BLO
F41	Coin Meter	+20VDC	1 Amp SLO-BLO

VIII. GENERAL INFORMATION

POWER SUPPLY SPECIFICATIONS

LOCATION	VOLTAGE	PROTECTION
Logic Board Assy.	+5VDC	Voltage adjustable. 6Amps over-voltage protection and fused for over-current protection.
Sound/Speech Board	+30VDC	1.5Amps fused for over-current protection. The reference for this circuit is a 1N5363 + 30VDC Zener controlling the base of an emitter follower pass transistor.
Sound/Speech Board	+12VDC -12VDC	100 milliamps fused for over-current protection. The plus and minus 12 volts supplies are the 7812 and 7912 IC regulators respectively.
Coin Meter	+20VDC	Full wave rectified unfiltered voltage, fused for over-current protection.
Coin Chute Lights	+4.5VDC	Full wave rectified unfiltered voltage, fused for over-current protection.
Monitor and Marquee	100VAC or 115VAC, 60HZ	Isolated, fused AC voltage.

IX. THEORY OF OPERATION

INTRODUCTION

The character based graphics system designated GG-III has two main subdivisions. The first subdivision is the Central Processor Unit (CPU) which has three partitions:

a. Microprocessors
b. Memory
c. Input and Output ports (I/O)

The Intel 8088 microprocessor is used and 32K bytes of memory is reserved for programming space and has 5 input ports and 5 output ports. The second subdivision is the video state machine which generates and controls the video signal to the monitor. The state machine has three partitions:

a. System Clock (CLK)
b. Foreground generator (FGND)
c. Background generator (BGND)

The system clock is driven by a 20MHZ crystal, divided down for a 5MHZ dot clock.

All inputs and outputs including the video control and general purpose I/O are memory-mapped, (i.e. everything within the system can be addressed in a single segment of 64K addresses as memory).

The video control unit is divided into an "object-oriented" foreground driver and "character-oriented" background driver. The screen resolution is 256 pixels horizontally, and 240 lines vertically for both foreground and background. The CPU communicates with the foreground driver and background driver by writing data into the designated memory areas in a certain format. The foreground is designed to display moving objects on the screen with a minimum overhead to the processor. The game programs will only have to specify the vertical and horizontal position and the object select number to the foreground driver. The background video supplements the foreground with relatively static figures on the screen. The CPU specifies all the character positions on the screen with desired "character " patterns.

A 5MHZ system clock drives a 9 bit horizontal dot counter and an 8 bit vertical line counter. The horizontal counter counts from 0 to 255 during active scan line and 256 to 317 during horizontal blanking time. When the horizontal counter reaches 317, the horizontal counter resets to 0. At the beginning of the horizontal blanking time (horizontal counter = 256) it increments the vertical counter. The vertical counter counts from 0 to 239 during active vertical scan time and 240 to 255 during vertical blanking time.

The battery backup system supports two battery RAM's that store all of the bookkeeping functions. The battery is maintained at a +3.6V reference by a trickle charge supplied on the logic board regulated by a current limiting resistor. If the AC power to the game is interrupted, the battery allows the RAM's to store the data contained in the Distrubutors table and the Options/Parameters screen.

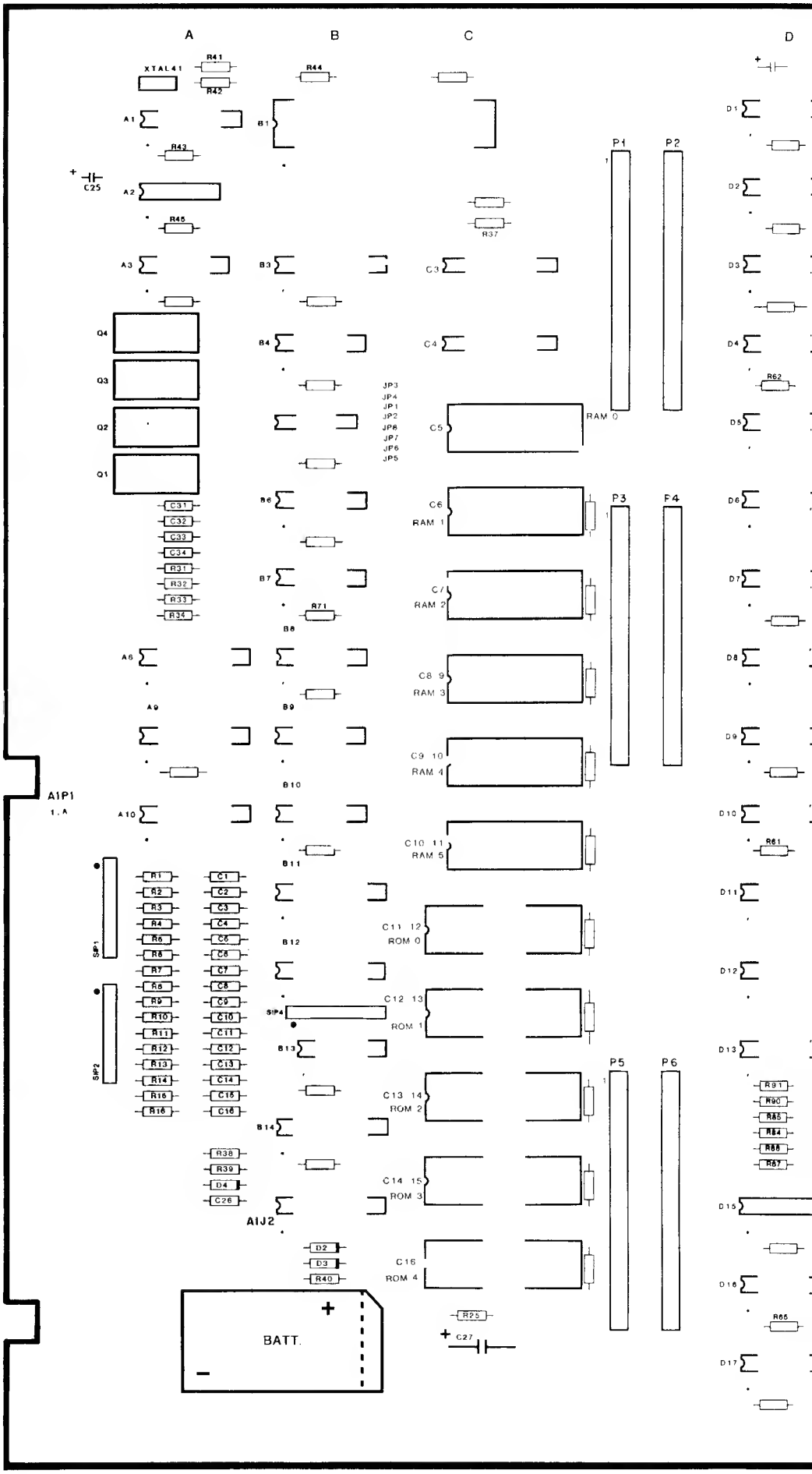
X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

TABLE OF CONTENTS

LOGIC BOARD ASSY. (A1), PARTS LIST

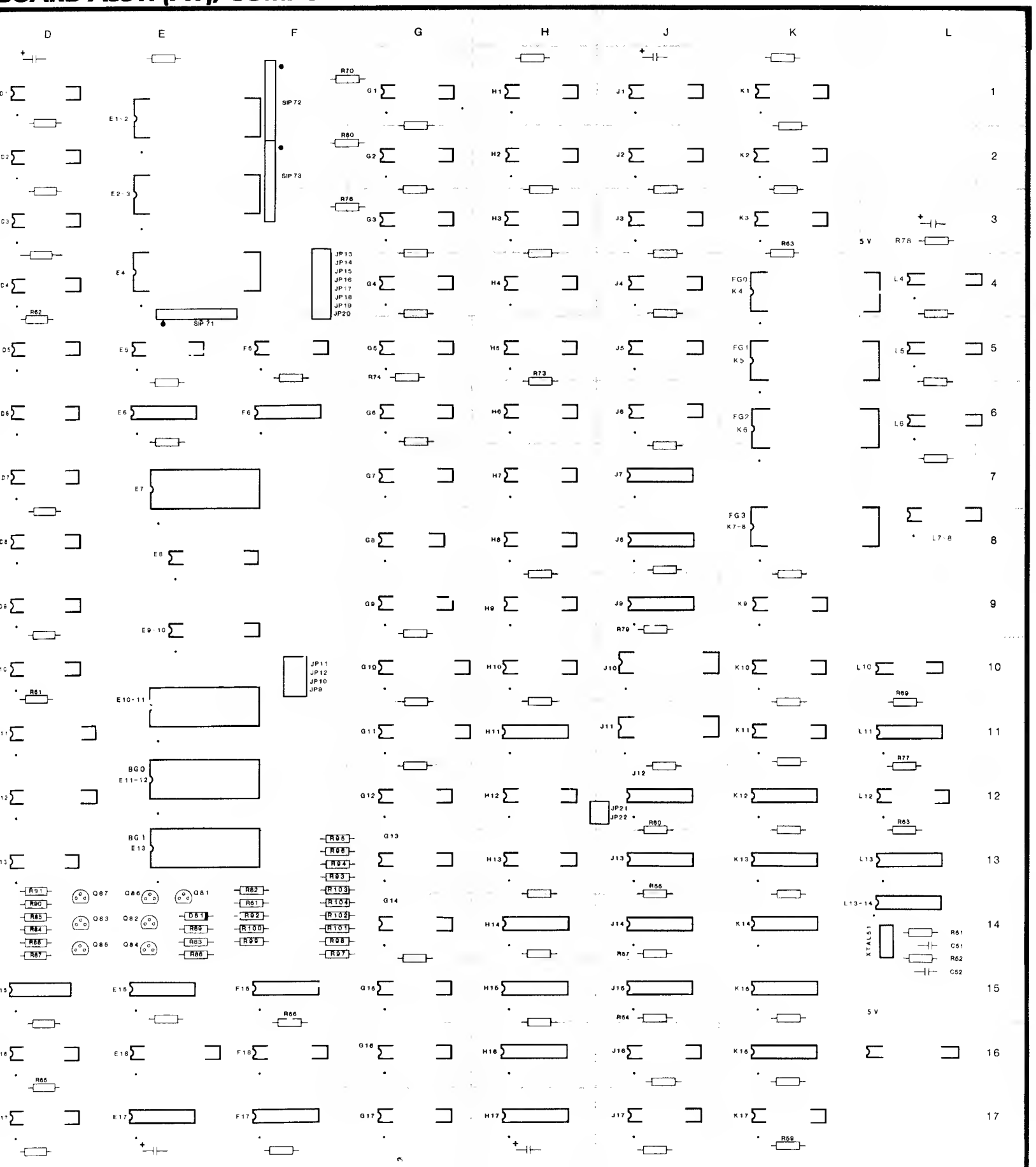
MISCELLANEOUS ELECTRONIC COMPONENTS

REFERENCE	DESCRIPTION	PART NO.
Bat 1	Battery, 3 6V	XO-458
C1-C16	Capacitor, 0.1 UF 50V AX. CR. +80%-20%	XO-230
C25	Capacitor, 100 UF, 25V EL-AX	XO-212
C26	Capacitor, 0.1 UF, 50V AX. CR. +80%-20%	XO-230
C27	Capacitor, 100 UF, 25V EL-AX	XO-212
C31-34	Capacitor, 0.1 UF, 50V AX. CR. +80%-20%	XO-230
C51	Capacitor, 100 PF, 100V CMD 5%	XO-198
C52	Capacitor, 0.1 UF, 100V CMD 5%	XO-196
ALL UNMARKED CAPACITORS	.01 UF, 50V AX CR. +80%-20%	XO-229
ALL POLARIZED UNMARKED CAPACITORS	10 UF, 25V AX. TANT. 10%	XO-127
D2	Diode, 1N4454	XO-275
D4	Diode, 1N4733A	XO-274
D81	Diode, 1N4148	XO-261
O1-O4	Transistor, 2N6044	XO-120
Q81-Q87	Transistor, MPSA70	XO-309
R1-R16	Resistor, 470 OHM, 5% ¼W	XO-35
R37, R38	Resistor, 330 OHM, 5% ¼W	XO-34
R39	Resistor, 130 OHM, 5% ¼W	XO-172
R40	Resistor, 270 OHM, 5% ¼W	XO-68
R41, R42	Resistor, 510 OHM, 5% ¼W	XO-25
R43	Resistor, 130 OHM, 5% ¼W	XO-172
R44, R45	Resistor, 1K OHM, 5% ¼W	XO-5
R51, R52	Resistor, 330 OHM, 5% ¼W	XO-34
R53, R54, R56	Resistor, 1K OHM, 5% ¼W	XO-5
R57, R58	Resistor, 560 OHM, 5% ¼W	XO-36
R59-R61	Resistor, 1K OHM, 5% ¼W	XO-5
R63, R64	Resistor, 1K OHM, 5% ¼W	XO-5
R70	Resistor, 1K OHM, 5% ¼W	XO-5
R73, R74	Resistor, 1K OHM, 5% ¼W	XO-5
R76-R80	Resistor, 1K OHM, 5% ¼W	XO-5
R81	Resistor, 820 OHM, 5% ¼W	XO-174
R82	Resistor, 100 OHM, 5% ¼W	XO-28
R83, R84	Resistor, 15 OHM, 5% ¼W	XO-171
R85	Resistor, 180 OHM, 5% ¼W	XO-24
R86, R87	Resistor, 15 OHM, 5% ¼W	XO-171
R88	Resistor, 180 OHM, 5% ¼W	XO-24
R89, R90	Resistor, 15 OHM, 5% ¼W	XO-171
R91	Resistor, 180 OHM, 5% ¼W	XO-24
R92	Resistor, 1K OHM, 5% ¼W	XO-5
R93	Resistor, 2K OHM, 5% ¼W	XO-14
R94	Resistor, 1K OHM, 5% ¼W	XO-5
R95	Resistor, 470 OHM, 5% ¼W	XO-35
R96	Resistor, 240 OHM, 5% ¼W	XO-173
R97	Resistor, 2K OHM, 5% ¼W	XO-14
R98	Resistor, 1K OHM, 5% ¼W	XO-5
R99	Resistor, 470 OHM, 5% ¼W	XO-35
R100	Resistor, 240 OHM, 5% ¼W	XO-173
R101	Resistor, 2K OHM, 5% ¼W	XO-14
R102	Resistor, 1K OHM, 5% ¼W	XO-5
R103	Resistor, 470 OHM, 5% ¼W	XO-35
R104	Resistor, 240 OHM, 5% ¼W	XO-173
SIP 1, SIP 2, SIP 4	Resistor, Dip, 4 7K, 9 Pin	XO-492
SIP 71, SIP 72, SIP 73	Resistor, Dip, 1K, 9 Pin	XO-493
X-TAL 1	Crystal, 15 MHZ	XO-482
XTAL 51	Crystal 20 MHZ	XO-494
	Dip Switch	XO-505
	20 Pin Dip Socket	XO-491
	22 Pin Dip Socket	XO-467
	24 Pin Dip Socket	XO-529
	28 Pin Dip Socket	XO-536
	40 Pin Dip Socket	XO-530



MATIC DIAGRAMS, PARTS LISTS

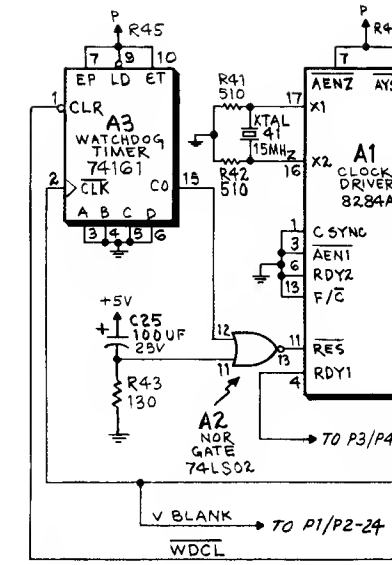
BOARD ASSY. (A1), COMPONENT LOCATION

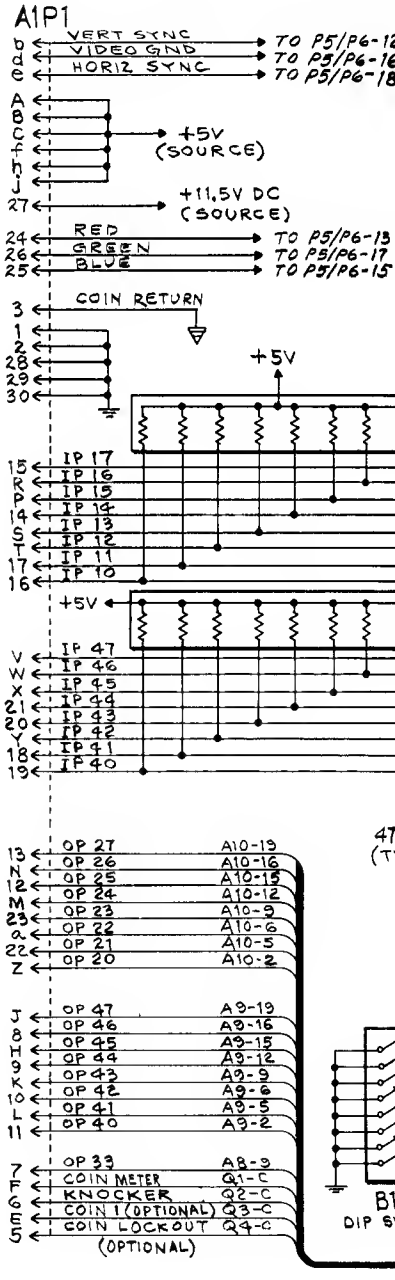


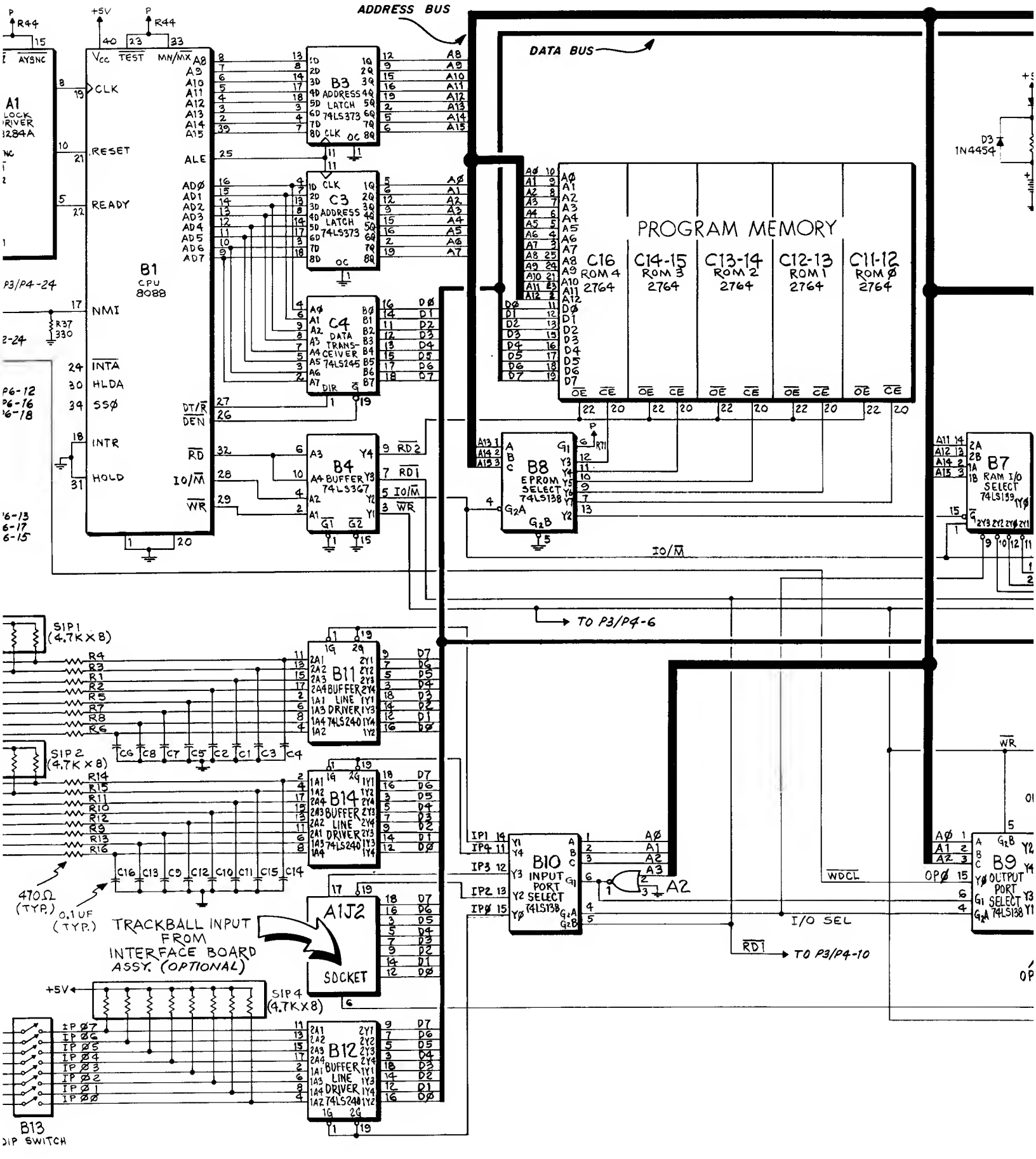
LOGIC BOARD ASSY. (A1), PARTS LIST (CONT.)

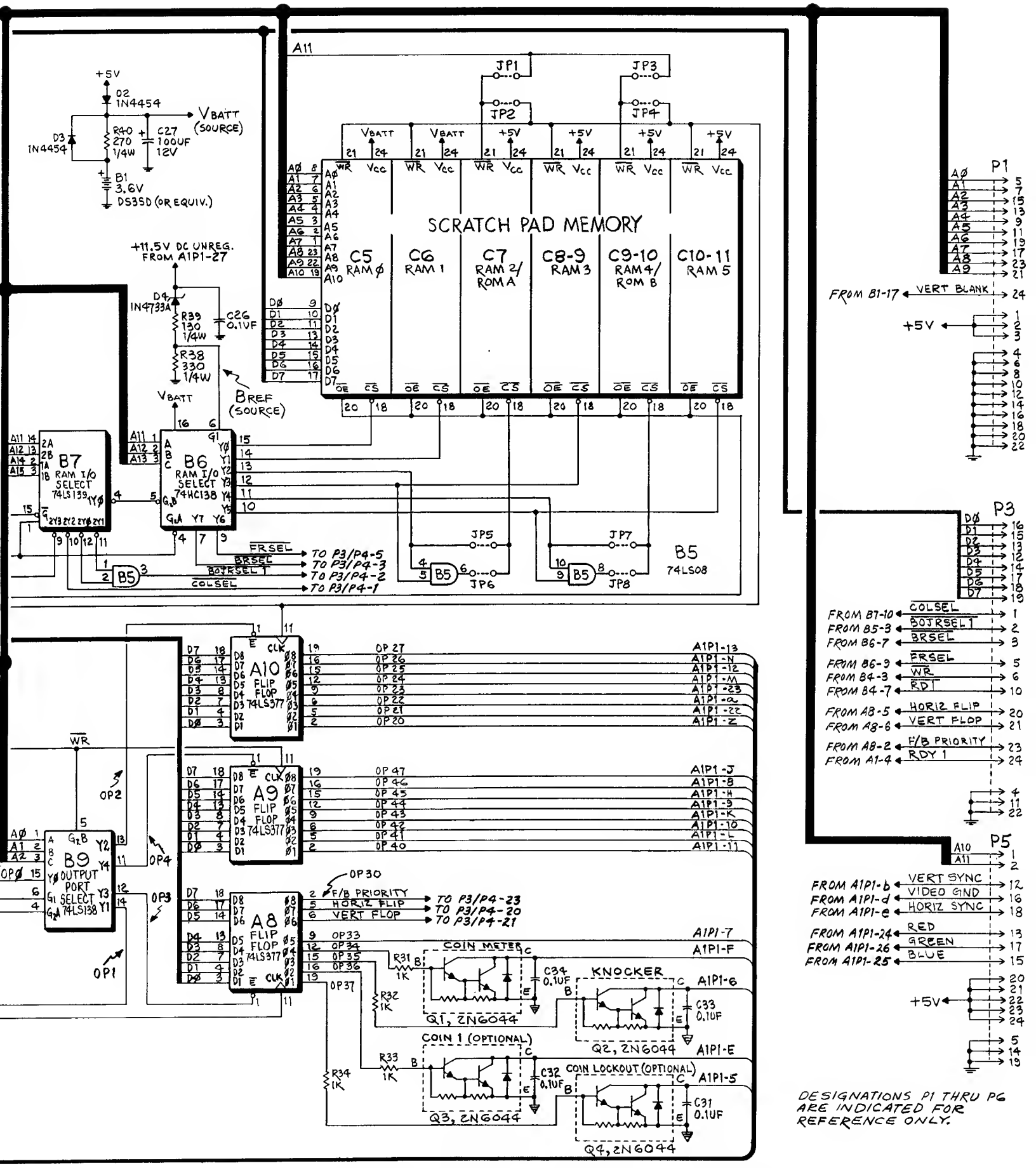
INTEGRATED CIRCUITS

REFERENCE	DESCRIPTION	PART NO.
	Logic Board Assy.	MA-378
A1	8284 CLK Driver	XO-478
A2	74LS02 Quad 2-input "NOR" gate	XO-428
A3	74161 Synchronous 4-bit counter	XO-192
A8, A9, A10	74LS377 Octal "D" Flip Flop	XO-97
B1	8088 CPU	XO-490
B3	74LS373 Octal D-type flip flop	XO-445
B4	74LS367 Hex 3-state buffer	XO-444
B5	74LS08 Quad 2-input "AND" gate	XO-86
B6	74HC138 Decoder/demultiplexer	XO-190
B7	74LS139 Dual 1 of 4 decoder	XO-419
B8, B9, B10	74LS138 1 of 8 dedocer	XO-437
B11, B12, B14	74LS240 Octal Buffer/line driver	XO-91
C3	74LS373 Octal D-type flip flop	XO-445
C4	74LS245 Octal Bus transceiver	XO-79
C5	RAM Ø 6116LP-4	XO-191
C6	RAM 1 6116LP-4	XO-191
C7	RAM 2 2128-2	XO-195
C8-9	RAM 3 2128-2	XO-195
C11-12	ROM Ø 2764 8K x 8 EPROM	XO-489
C12-13	ROM 1 2764 8K x 8 EPROM	XO-489
C13-14	ROM 2 2764 8K x 8 EPROM	XO-489
D1	74LS139 Dual 1 of 4 Decoder	XO-419
D2, D3, D4, D5, D6, D7, D8, D9, D10	74157 Quad 2-input multiplexer	XO-114
D11	74LS374 Octal D-type flip flop	XO-96
D12	74LS244 Octal buffer/line driver	XO-117
D13	74LS157 Quad 2-input multiplexer	XO-390
D15	74LS86 Quad 2-input exclusive "OR" gate	XO-435
D16	74LS283 4-bit binary full adder	XO-95
D17	74S161 Synchronous presettable binary counter	XO-488
E1-2, E2-3, E4	93419 64 x 9 bipolar RAM	XO-99
E5	74LS283 4-bit binary full adder	XO-95
E6	74LS30 8-input "NAND"	XO-432
E7	4801 1K x 8 RAM	XO-193
E8, E9-10	74LS245 Octal Bus Transceiver	XO-79
E10-11	4801 1K x 8 RAM	XO-193
E11-12	2732A (BGØ) 4K x 8 EPROM	XO-485
E13	2732A (BG1) 4K x 8 EPROM	XO-485
E15	74LS86 Quad 2-input exclusive "OR" gate	XO-435
E16	74LS273 8-bit register	XO-94
E17	74LS20 Dual 4-input "NAND" gate	XO-430
F5	74LS283 4-bit binary full adder	XO-95
F6	74LS32 Quad 2-input "OR" gate	XO-433
F15	74LS04 Hex inverter	XO-418
F16	74S161 Synchronous presettable binary counter	XO-488
F17	74LS86 Quad 2-input exclusive "OR" gate	XO-435
G1, G2, G3, G4, G5	74LS157 Quad 2-input multiplexer	XO-390
G6	74LS161 Synchronous presettable binary counter	XO-440
G7	74157 Quad 2-input multiplexer	XO-114
G8	74LS74 Dual D-type flip flop	XO-434
G9	74S157 Quad 2-input multiplexer	XO-124
G10	74LS245 Octal bus transceiver	XO-79
G11	74LS374 Octal D-type flip flop	XO-96
G12	74LS157 Quad 2-input multiplexer	XO-390
G13, G14, G15	7489 64-bit RAM	XO-88
G16, G17	74LS174 Hex D flip flop	XO-442
H1, H2, H3, H4	74S189 64-bit RAM	XO-89
H5, H6, H7, H8, H9, H10	74S161 Synchronous presettable binary counter	XO-488
H11	74LS157 Quad 2-input multiplexer	XO-390
H12	74LS260 Dual 5-input "NOR" gate	XO-93
H13	74LS298 Quad 2-port register	XO-118
H14	74LS157 Quad 2-input multiplexer	XO-390
H15	74LS00 Quad 2-input "NAND" gate	XO-427
H16, H17	74LS30 8 input "NAND" gate	XO-432
J1, J2, J3, J4, J5, J6	74LS86 Dual 2-input exclusive "OR" gate	XO-435
J7	74S189 64-bit RAM	XO-89
J8	74LS04 Hex inverter	XO-418
J9	74LS32 Quad 2-input "OR" gate	XO-433
J10, J11	7408 Quad 2-input "AND" gate	XO-404
J12	93422 256 x 2 bipolar RAM	XO-100
J13	74LS02 Quad 2-input "NOR" gate	XO-428
J14	74LS74 Dual D-type flip flop	XO-434
J15	7407 Hex buffer/driver	XO-384
J16, J17	74LS30 8 input "NAND" gate	XO-432
K1, K2, K3	74S161 Synchronous presettable binary counter	XO-488
K4	74LS379 Quad D-type flip flop	XO-98
K5	FG0 2764-3 8K x 8 EPROM	XO-489
K6	FG1 2764-3 8K x 8 EPROM	XO-489
K7-8	FG2 2764-3 8K x 8 EPROM	XO-489
K9, K10, K11	FG3 2764-3 8K x 8 EPROM	XO-489
K12	74LS157 Quad 2-input multiplexer	XO-390
K13	74LS260 Dual 5-input "NOR" gate	XO-93
K14	74LS32 Quad 2-input "OR" gate	XO-433
K15	74LS08 Quad 2-input "AND" gate	XO-86
K16	74S04 Hex inverter	XO-400
K17	74LS20 Dual 4-input "NAND" gate	XO-430
L4, L5, L6, L7	74S161 Synchronous presettable binary counter	XO-488
L10	74LS166 8-bit shift register	XO-391
L11	74LS74 Dual flip flop	XO-434
L12	74LS20 Dual 4-input "NAND" gate	XO-430
L13	74LS161 Synchronous presettable binary counter	XO-440
L13-14	74S74 Dual D-type pos. edge trig. flip flop (T. I. only)	XO-87
	74S04 Hex inverter	XO-400

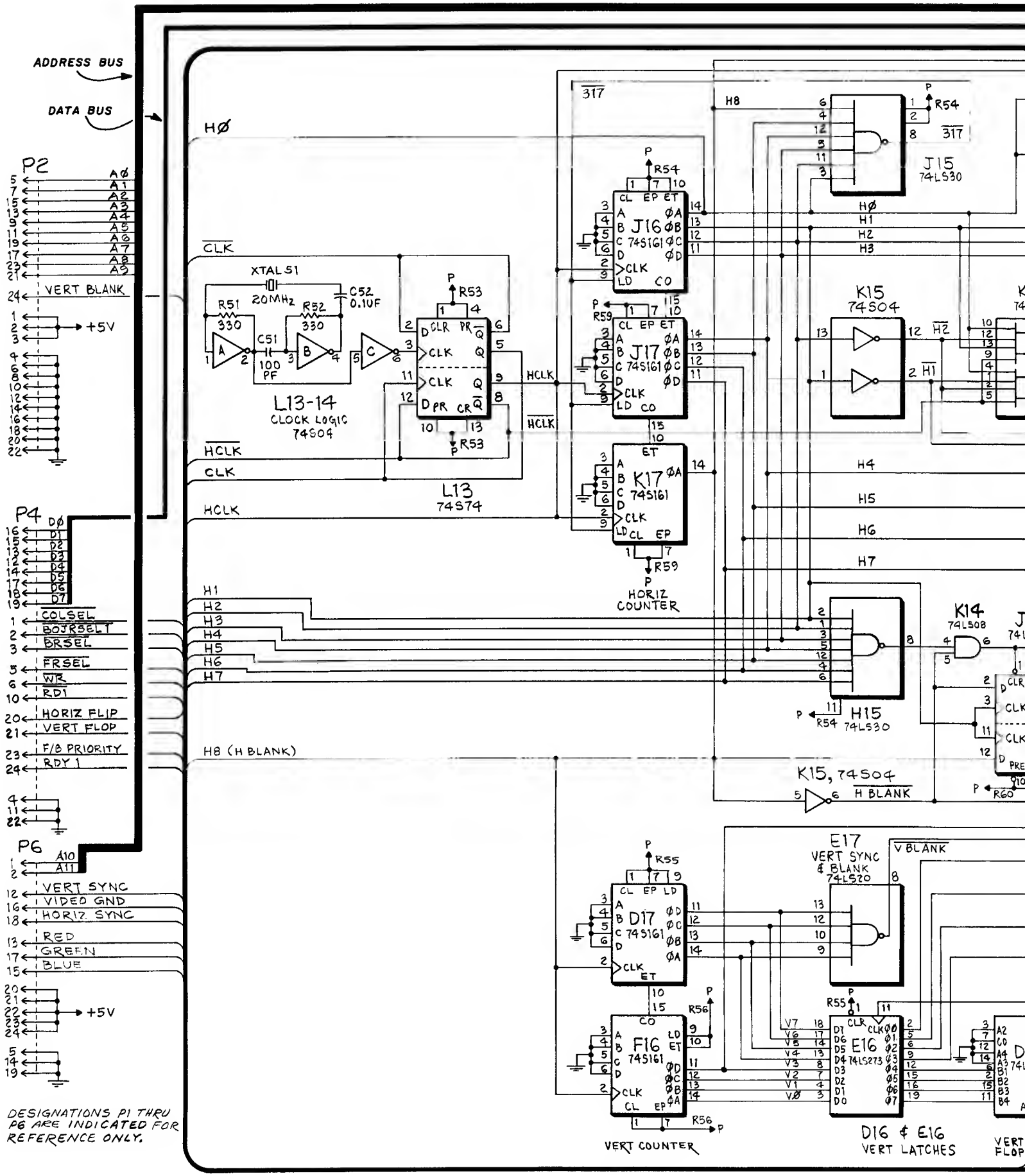


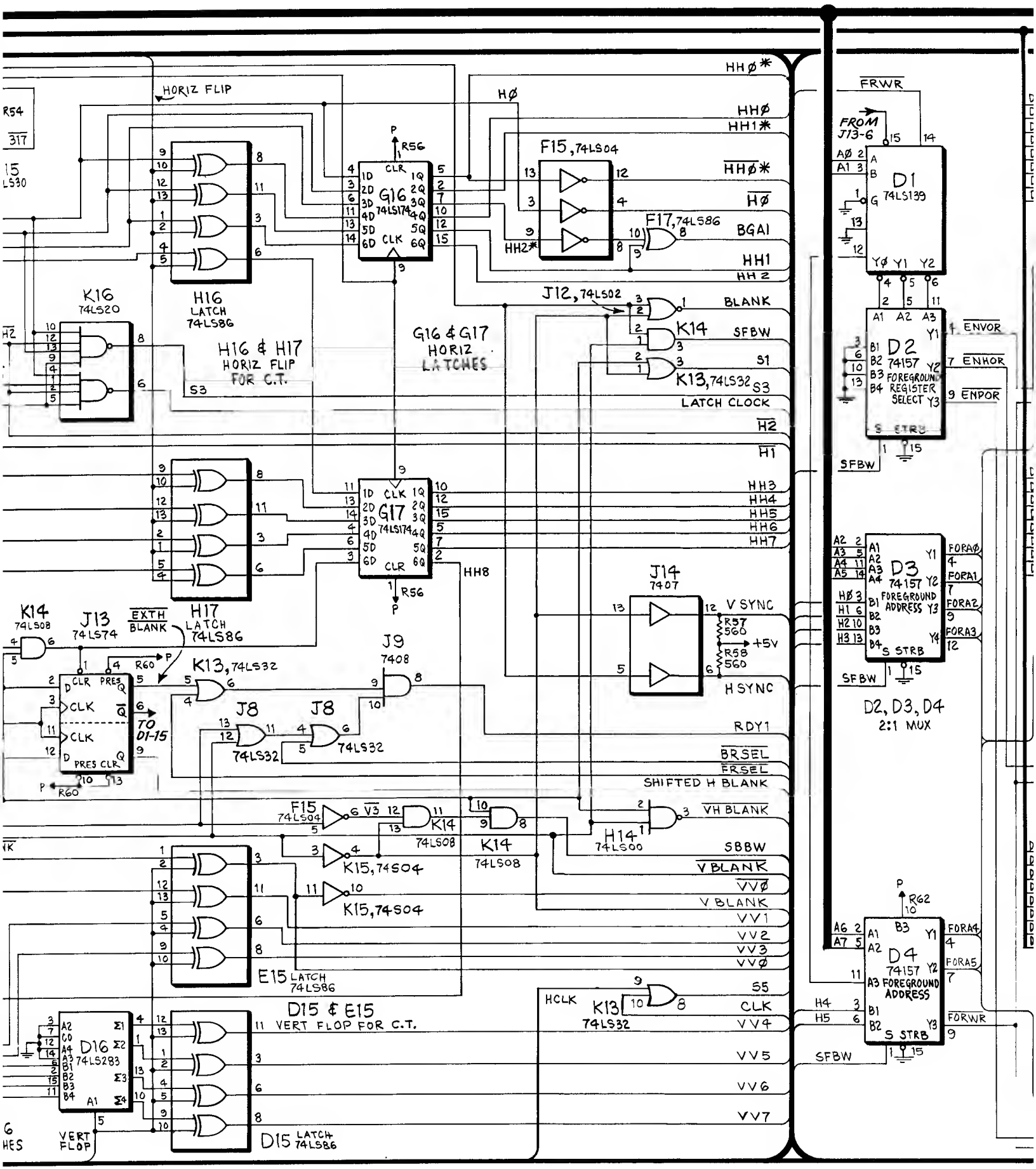


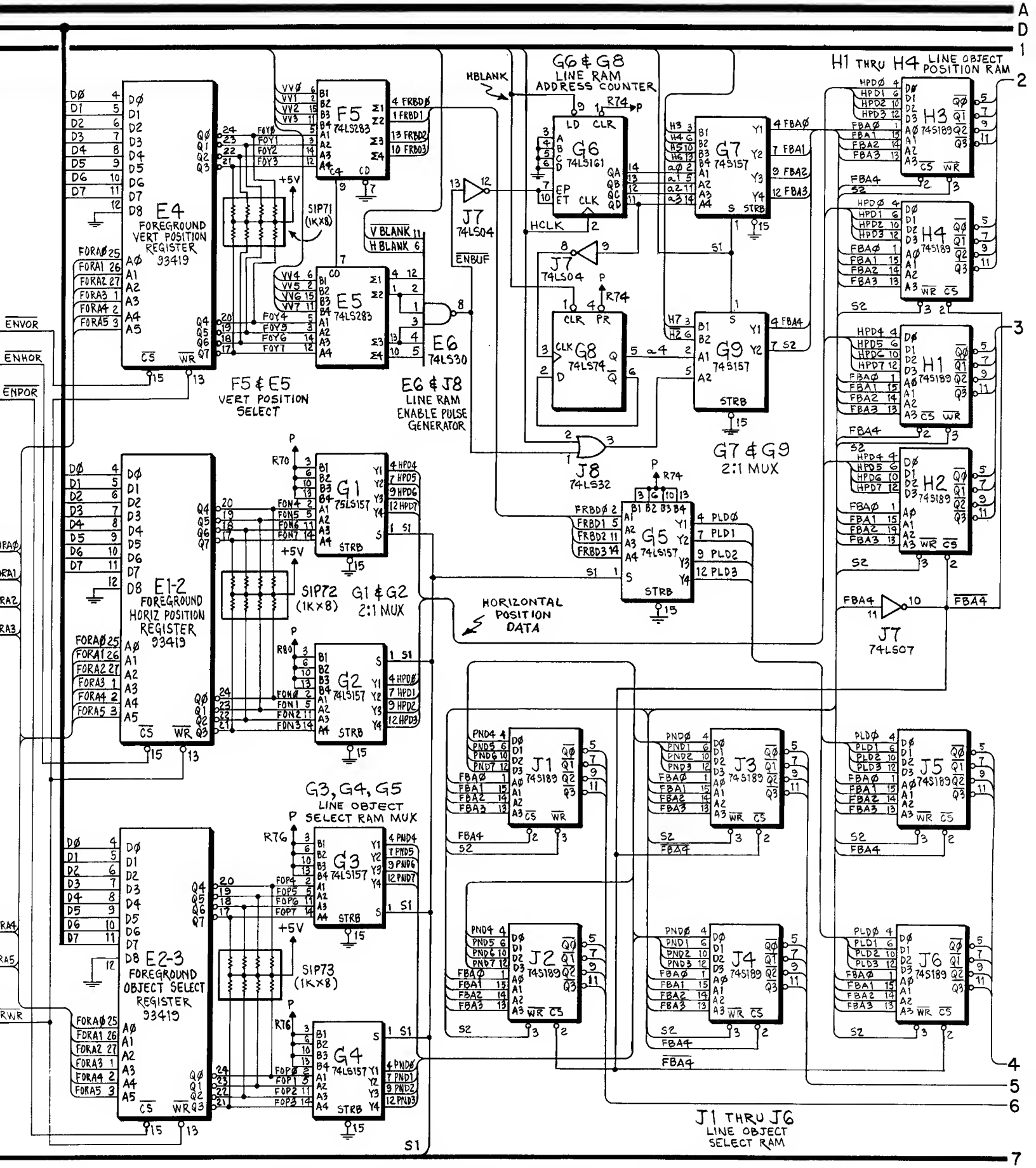

ADDRESS BUS
DATA BUS
B1 CPU 8088
B3 ADDRESS LATCH 74LS373
C3 ADDRESS LATCH 74LS373
C4 DATA TRANSCEIVER 74LS245
B4 BUFFER 74LS367
PROGRAM MEMORY
C16 ROM 4 2764
C14-15 ROM 3 2764
C13-14 ROM 2 2764
C12-13 ROM 1 2764
C11-12 ROM Ø 2764
B8 EPROM SELECT 74LS138
B7 RAM I/O SELECT 74LS139
IO/M
TO P3/P4-6
SIP1 (4.7K X 8)
SIP2 (4.7K X 8)
B11 BUFFER LINE DRIVER 74LS240
B14 BUFFER LINE DRIVER 74LS240
470Ω (TYP.)
0.1 UF (TYP.)
TRACKBALL INPUT FROM INTERFACE BOARD ASSY. (OPTIONAL)
A1J2 SOCKET
SIP4 (4.7K X 8)
B12 BUFFER LINE DRIVER 74LS240
B13 DIP SWITCH
B10 INPUT PORT SELECT 74LS138
A2
I/O SEL
WDCL
RD1
TO P3/P4-10
B9 OUTPUT PORT SELECT 74LS138
D3 1N4454



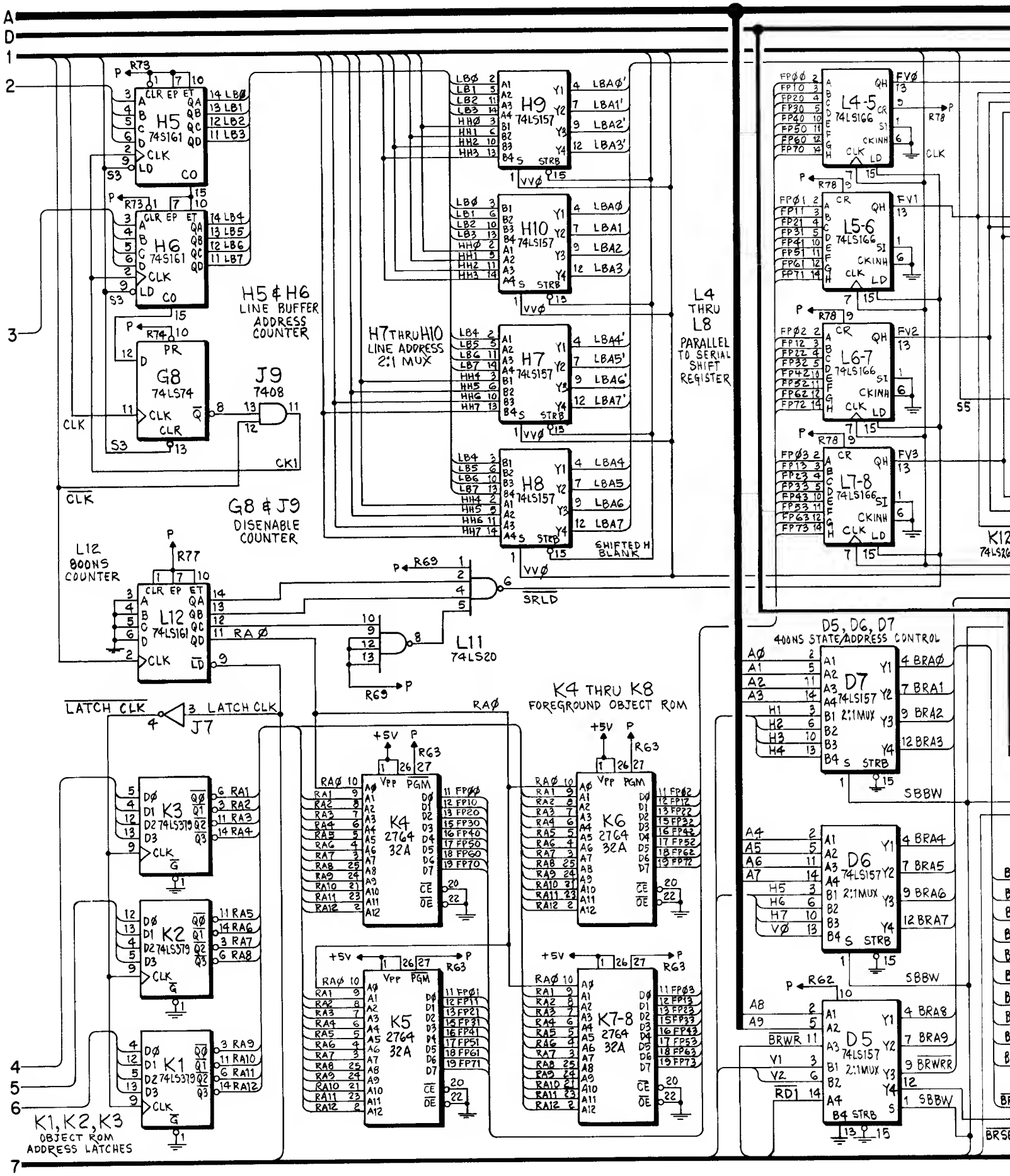
LOGIC BOARD ASSY. (A1), SCHEMATIC DIAGRAM, SHEET 1 OF 3

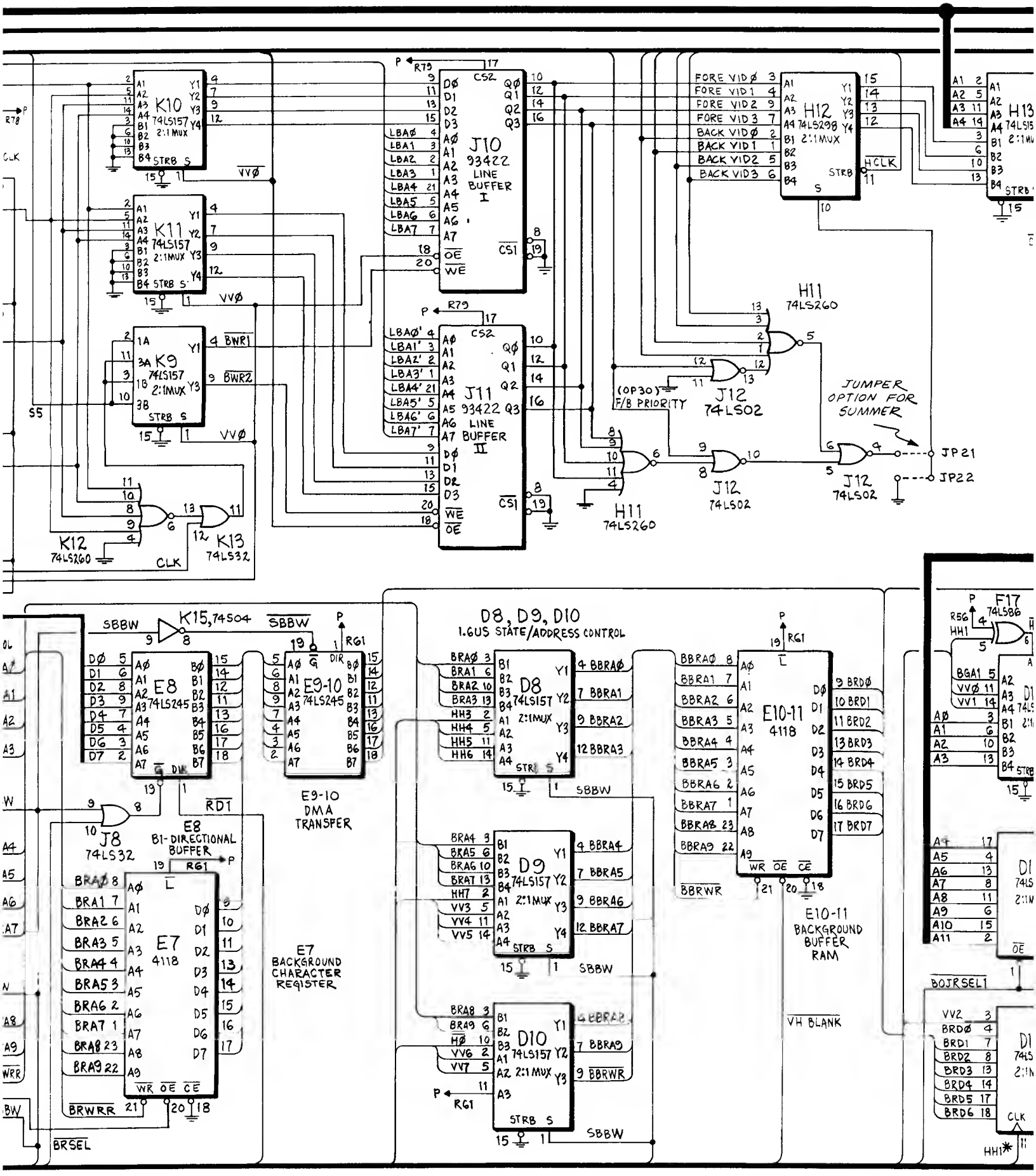

ADDRESS BUS
DATA BUS
P2
VERT BLANK
+5V
P4
COLSEL
BOJRSELT
BRSEL
FRSEL
WR
RD1
HORIZ FLIP
VERT FLOP
F/B PRIORITY
RDY 1
P6
VERT SYNC
VIDEO GND
HORIZ SYNC
RED
GREEN
BLUE
+5V
DESIGNATIONS P1 THRU P6 ARE INDICATED FOR REFERENCE ONLY.
HØ
CLK
XTAL 51
20MHz
C52 0.1UF
R51 330
R52 330
C51 100 PF
L13-14
CLOCK LOGIC
74S04
L13
74S74
HCLK
317
H8
J15
74LS30
J16 74S161
J17 74S161
K17 74S161
HORIZ COUNTER
K15
74S04
K14
74LS08
H15
74LS30
H1
H2
H3
H4
H5
H6
H7
H8 (H BLANK)
K15, 74S04
H BLANK
D17 74S161
F16 74S161
VERT COUNTER
E17
VERT SYNC & BLANK
74LS20
V BLANK
E16 74LS273
D16 & E16
VERT LATCHES

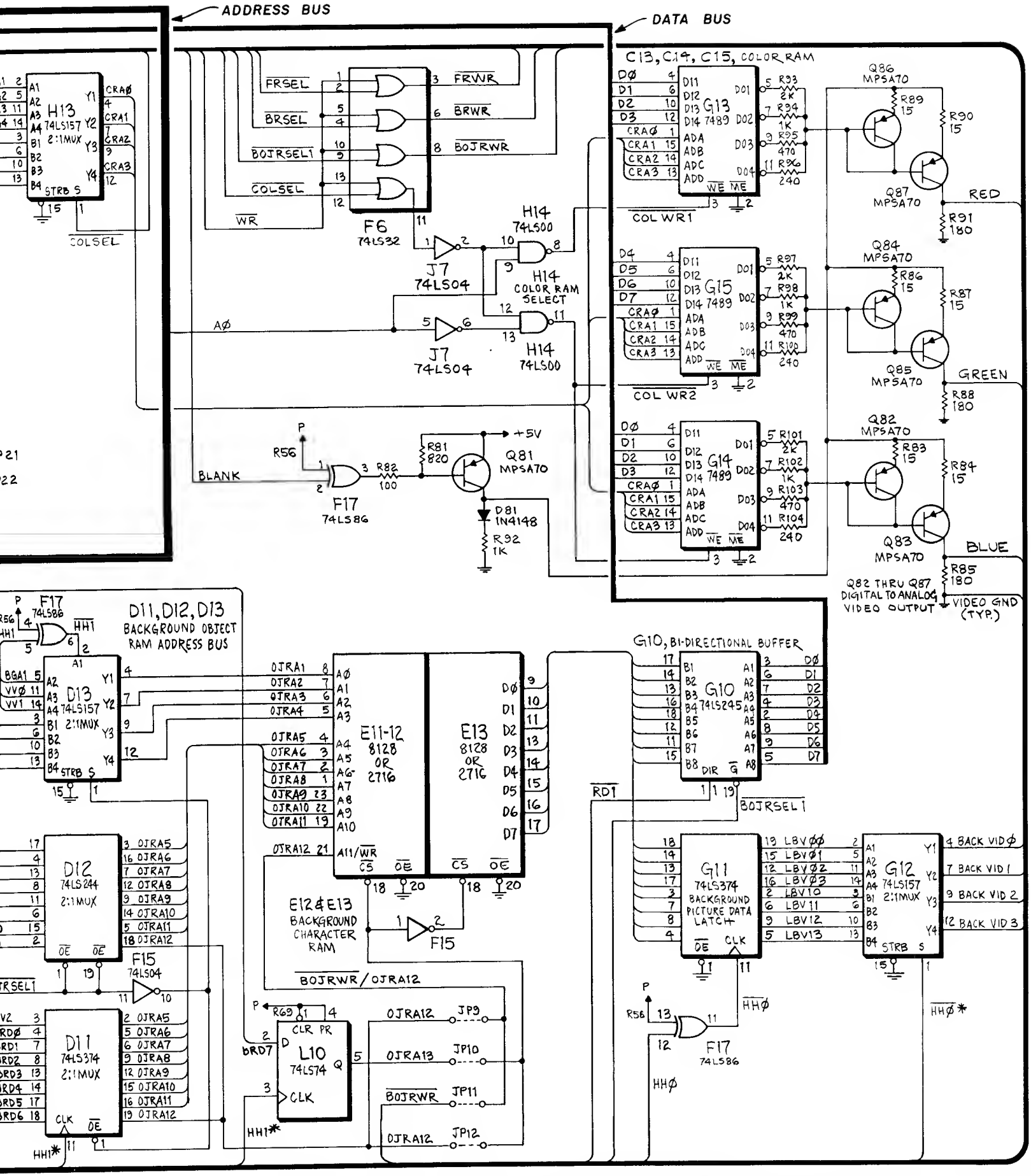

HHØ*
HORIZ FLIP
HØ
HHØ
HH1*
F15, 74LS04
HHØ*
HØ
F17, 74LS86
BGAI
HH1
HH2
HH2
K16
74LS20
H16
LATCH
74LS86
H16 & H17
HORIZ FLIP
FOR C.T.
S3
G16 & G17
HORIZ
LATCHES
J12, 74LS02
BLANK
K14
SFBW
S1
K13, 74LS32
S3
LATCH CLOCK
H2
H1
HH3
HH4
HH5
HH6
HH7
HH8
J14
7407
V SYNC
R57
560
+5V
R58
560
H SYNC
K14
74LS08
J13
74LS74
EXTH
BLANK
H17
LATCH
74LS86
J9
7408
K13, 74LS32
R60
TO
01-15
J8
74LS32
J8
74LS32
RDY1
BRSEL
FRSEL
SHIFTED H BLANK
F15
74LS04
V3
K14
74LS08
K14
74LS08
H14
74LS00
VH BLANK
SBBW
K15, 74S04
K15, 74S04
V BLANK
VVØ
VV1
VV2
VV3
VVØ
E15 LATCH
74LS86
D15 & E15
VERT FLOP FOR C.T.
HCLK
K13
74LS32
S5
CLK
VV4
VV5
VV6
VV7
D16
74LS283
VERT
FLOP
D15 LATCH
74LS86
FRWR
FROM
J73-6
D1
74LS139
ENVOR
ENHOR
D2
74157
FOREGROUND
REGISTER
SELECT
ENPOR
SFBW
D3
74157
FOREGROUND
ADDRESS
FORAØ
FORA1
FORA2
FORA3
SFBW
D2, D3, D4
2:1 MUX
D4
74157
FOREGROUND
ADDRESS
FORA4
FORA5
FORWR
SFBW



LOGIC BOARD ASSY. (A1), SCHEMATIC DIAGRAM, SHEET 2 OF 3


H5 & H6
LINE BUFFER
ADDRESS
COUNTER
H7 THRU H10
LINE ADDRESS
2:1 MUX
L4
THRU
L8
PARALLEL
TO SERIAL
SHIFT
REGISTER
G8 & J9
DISENABLE
COUNTER
L12
800NS
COUNTER
L11
74LS20
K4 THRU K8
FOREGROUND OBJECT ROM
K1, K2, K3
OBJECT ROM
ADDRESS LATCHES
D5, D6, D7
400NS STATE/ADDRESS CONTROL
SHIFTED H
BLANK
SRLD
LATCH CLK
CLK
CK1
RAØ
SBBW
BRWR
RD1

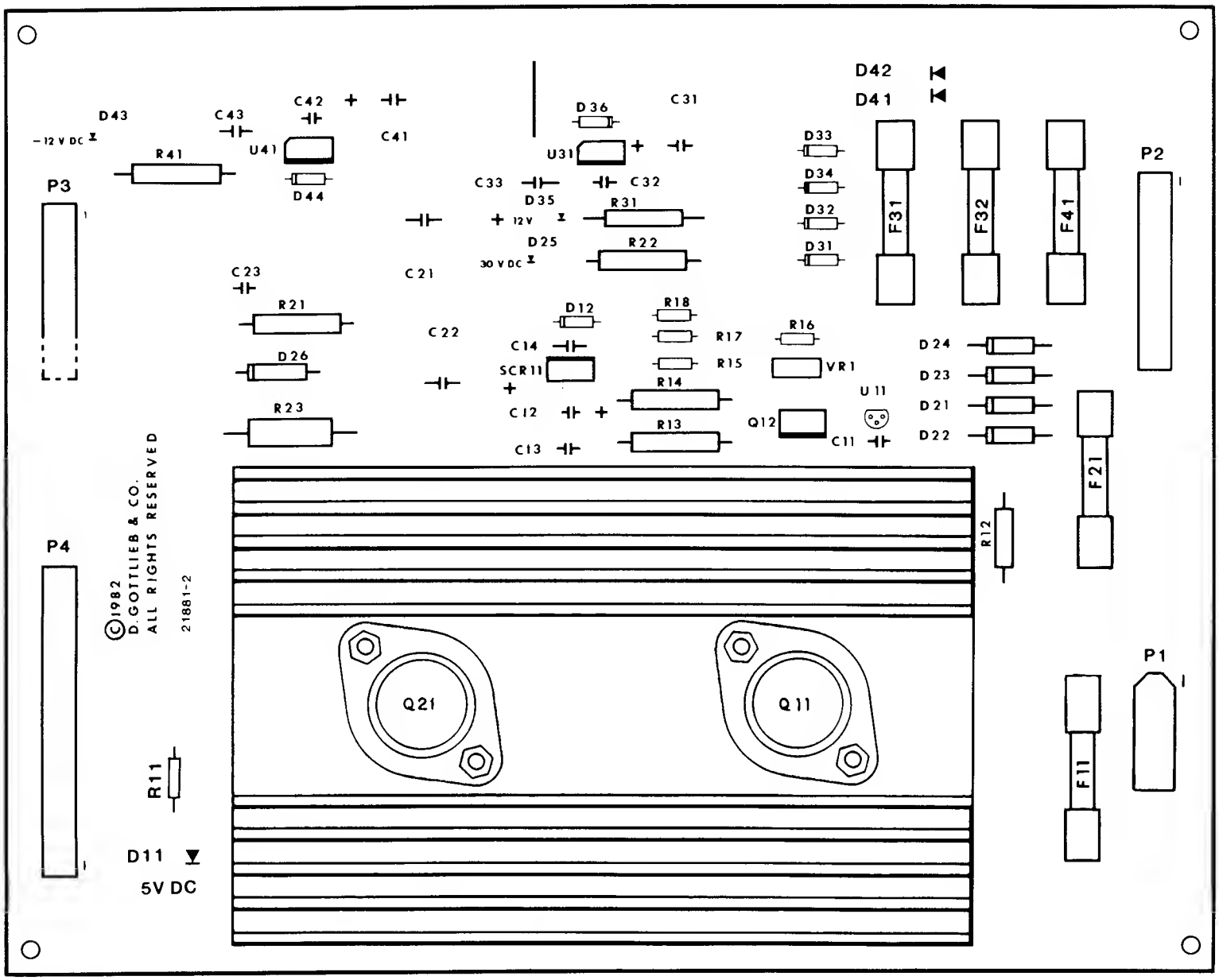

K10 74LS157 2:1MUX
K11 74LS157 2:1MUX
K9 74LS157 2:1MUX
K12 74LS260
K13 74LS32
J10 93422 LINE BUFFER I
J11 93422 LINE BUFFER II
H12 74LS298 2:1MUX
H11 74LS260
J12 74LS02
H13
JUMPER OPTION FOR SUMMER
JP21
JP22
(OP30) F/B PRIORITY
FORE VID Ø
FORE VID 1
FORE VID 2
FORE VID 3
BACK VID Ø
BACK VID1
BACK VID2
BACK VID3
HCLK
VVØ
BWR1
BWR2
K15, 74S04
E8 74LS245
E9-10 74LS245
E9-10 DMA TRANSFER
E8 BI-DIRECTIONAL BUFFER
J8 74LS32
RD1
D8, D9, D10 1.6US STATE/ADDRESS CONTROL
D8 74LS157 2:1MUX
D9 74LS157 2:1MUX
D10 74LS157 2:1MUX
E7 4118
E7 BACKGROUND CHARACTER REGISTER
E10-11 4118
E10-11 BACKGROUND BUFFER RAM
BRWRR
BBRWR
BRSEL
VH BLANK
F17 74LS86
BOJRSEL1
SBBW
RG1



LOGIC BOARD ASSY. (A1), SCHEMATIC DIAGRAM, SHEET 3 OF 3

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

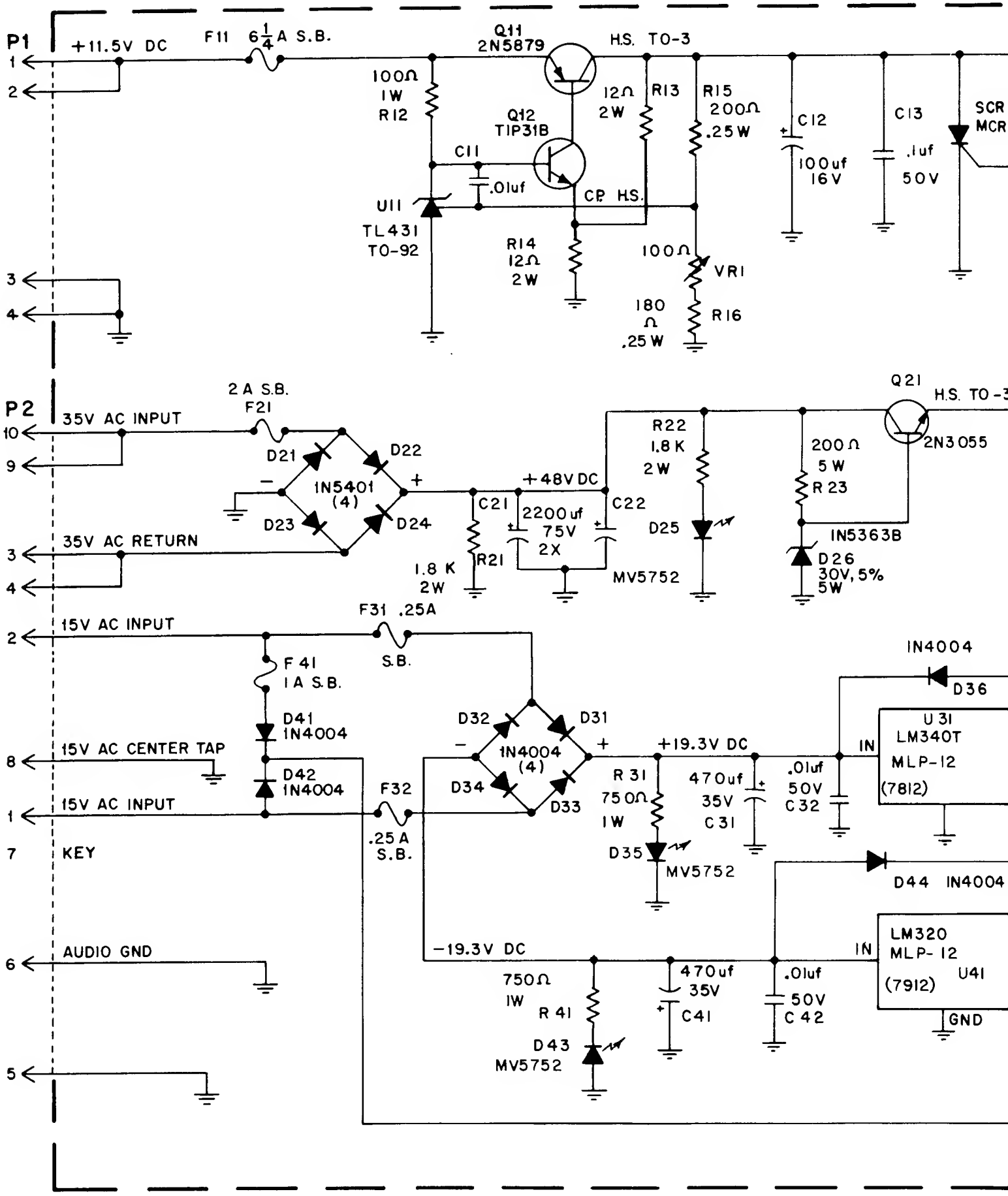
POWER SUPPLY ASSY. (A3), COMPONENT LOCATION

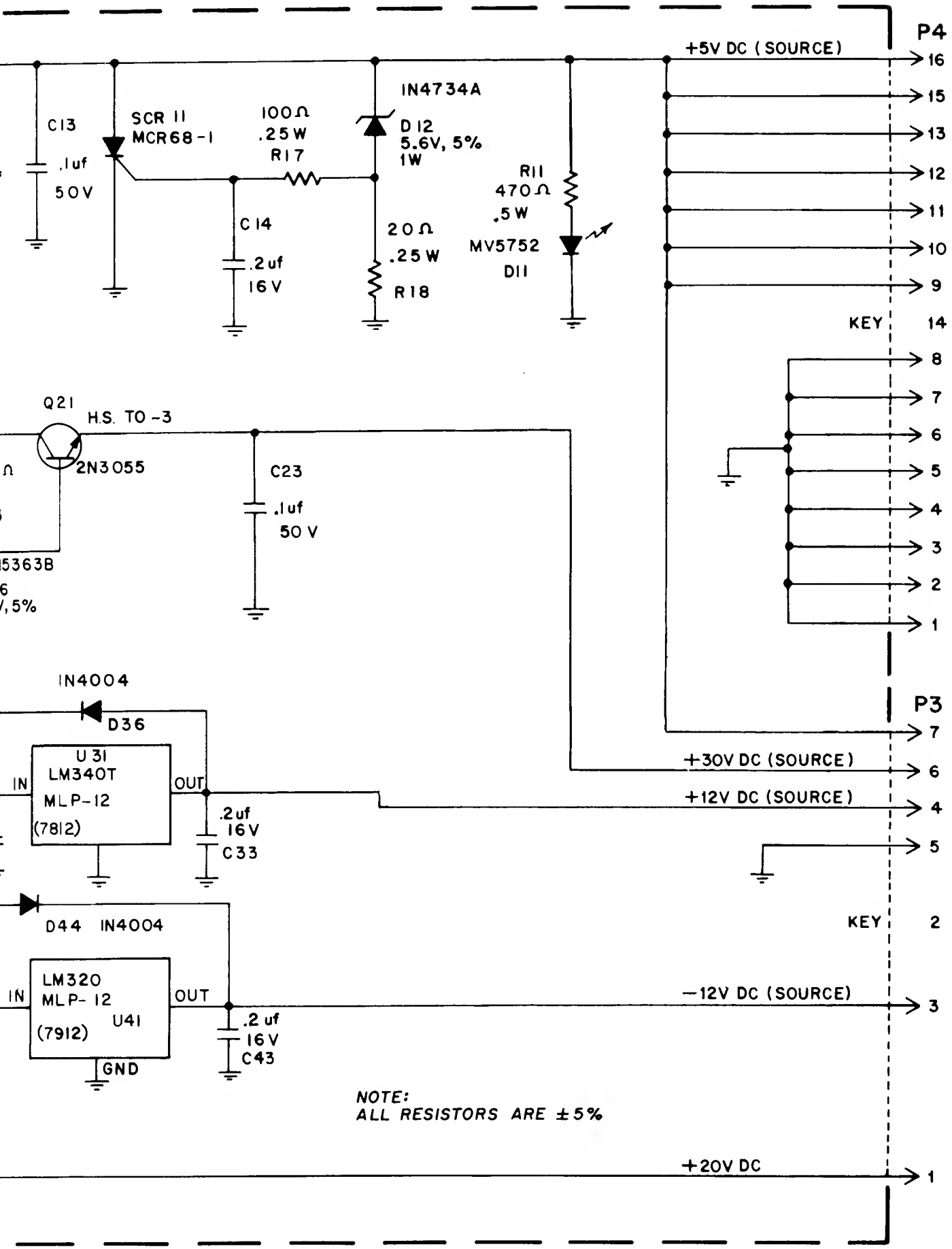


POWER SUPPLY ASSY. (A3), PARTS LIST

REFERENCE	DESCRIPTION	PART NO.
	Power Supply Assy.	MA-430
C11, C32, C42	Capacitor, .01 mfd , 50V	XO-229
C12	Capacitor, 100UF, 16V	XO-235
C13, C23	Capacitor, 0.1UF, 100V	XO-234
C14, C33, C43	Capacitor, 0.2UF, 16V	XO-205
C21, C22	Capacitor, 2200UF, 75V	XO-132
C31, C41	Capacitor, 470UF, 35V	XO-284
D11, D25		
D35, D43	Diode, Light Emitting MV-5752	XO-270
D12	Diode, Zener, 5.6V, 5%, 1W, 1N4734A	XO-255
D21-D24	Diode, 1N5401	XO-263
D26	Diode, Zener, 30V, 5%, 5W, 1N5363B	XO-273
D31-D34, D36		
D41, D42, D44	Diode, 1N4004	XO-254
F11	Fuse, 6¼ AMP SLO-BLO	EL-8
F21	Fuse, 2 AMP SLO-BLO	EL-7
F31, F32	Fuse, ¼ AMP SLO-BLO	EL-5
F41	Fuse, 1 AMP SLO-BLO	EL-6
P1	Connector, 4 PIN	PS-87

REFERENCE	DESCRIPTION	PART NO.
P2	Connector, 10 PIN	XO-531
P3	Connector, 7 PIN	XO-526
P4	Connector, 16 PIN	XO-372
Q11	Transistor, PNP, 2N5879	XO-323
Q12	Transistor, NPN, T1P31B	XO-641
Q21	Transistor, NPN, 2N3055	XO-301
R11	Resistor, 470 OHM, 5% ½W	XO-55
R12	Resistor, 100 OHM, 5% 1W	XO-137
R13, R14	Resistor, 12 OHM, 5% 2W	XO-138
R15	Resistor, 200 OHM, 5% ¼W	XO-143
R16	Resistor, 180 OHM, 5% ¼W	XO-24
R17	Resistor, 100 OHM, 5% ¼W	XO-28
R18	Resistor, 20 OHM, 5% ¼W	XO-29
R21, R22	Resistor, 1.8KOHM, 5% 2W	XO-135
R23	Resistor, 200 OHM, 5% 5W	XO-133
R31, R41	Resistor, 750 OHM, 5% 1W	XO-136
SCR11	Silicon Controlled Rectifier	XO-131
U11	Diode, Programmable Zener TL431	XO-272
U31	Voltage Regulator +12V, LM 340T	XO-473
U41	Voltage Regulator -12V, LM 320	XO-130
VR1	Potentiometer, 100 OHM	XO-134

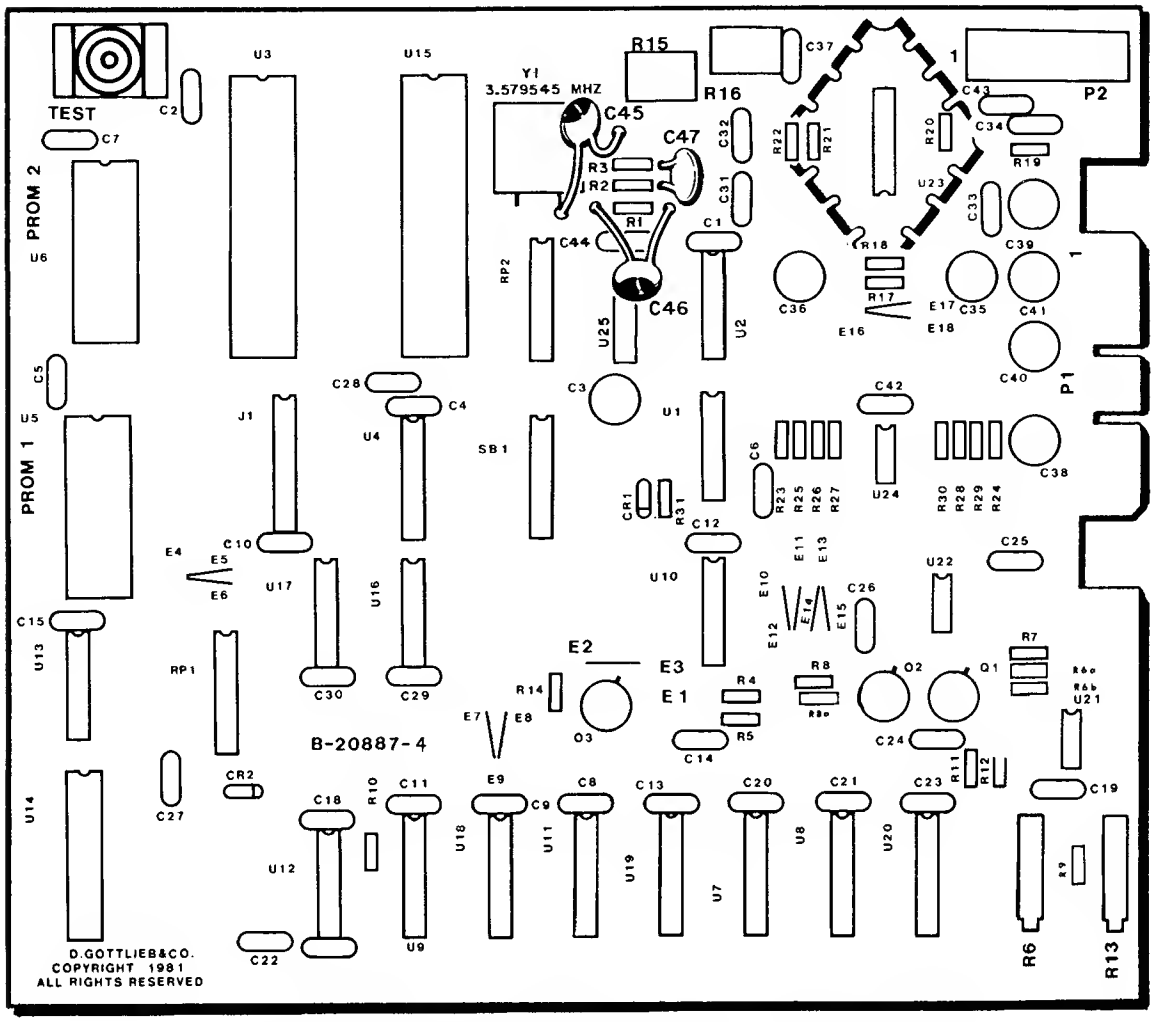

P1
1
2
3
4
+11.5V DC
F11 6¼A S.B.
Q11
2N5879
H.S. TO-3
100Ω
1W
R12
12Ω
2W
R13
R15
200Ω
.25W
C12
100uf
16V
C13
.1uf
50V
SCR
MCR
Q12
TIP31B
C11
.01uf
CP. H.S.
U11
TL431
TO-92
R14
12Ω
2W
100Ω
VR1
180
Ω
.25W
R16
P2
10
9
35V AC INPUT
2 A S.B.
F21
D21
D22
1N5401
(4)
D23
D24
+48V DC
C21
2200uf
75V
2X
C22
1.8 K
2W
R21
MV5752
R22
1.8 K
2W
D25
Q21
H.S. TO-3
2N3055
200Ω
5W
R 23
IN5363B
D26
30V, 5%
5W
3
4
35V AC RETURN
2
15V AC INPUT
F31 .25A
S.B.
F 41
1A S.B.
D41
1N4004
D42
1N4004
8
15V AC CENTER TAP
1
15V AC INPUT
7
KEY
F32
.25A
S.B.
D32
D31
1N4004
(4)
D34
D33
+19.3V DC
R 31
750Ω
1W
D35
MV5752
470uf
35V
C 31
.01uf
50V
C 32
IN4004
D36
U 31
LM340T
MLP-12
(7812)
IN
D44 IN4004
6
AUDIO GND
-19.3V DC
750Ω
1W
R 41
D43
MV5752
470uf
35V
C41
.01uf
50V
C 42
LM320
MLP-12
U41
(7912)
GND
5



POWER SUPPLY ASSY. (A3), SCHEMATIC DIAGRAM

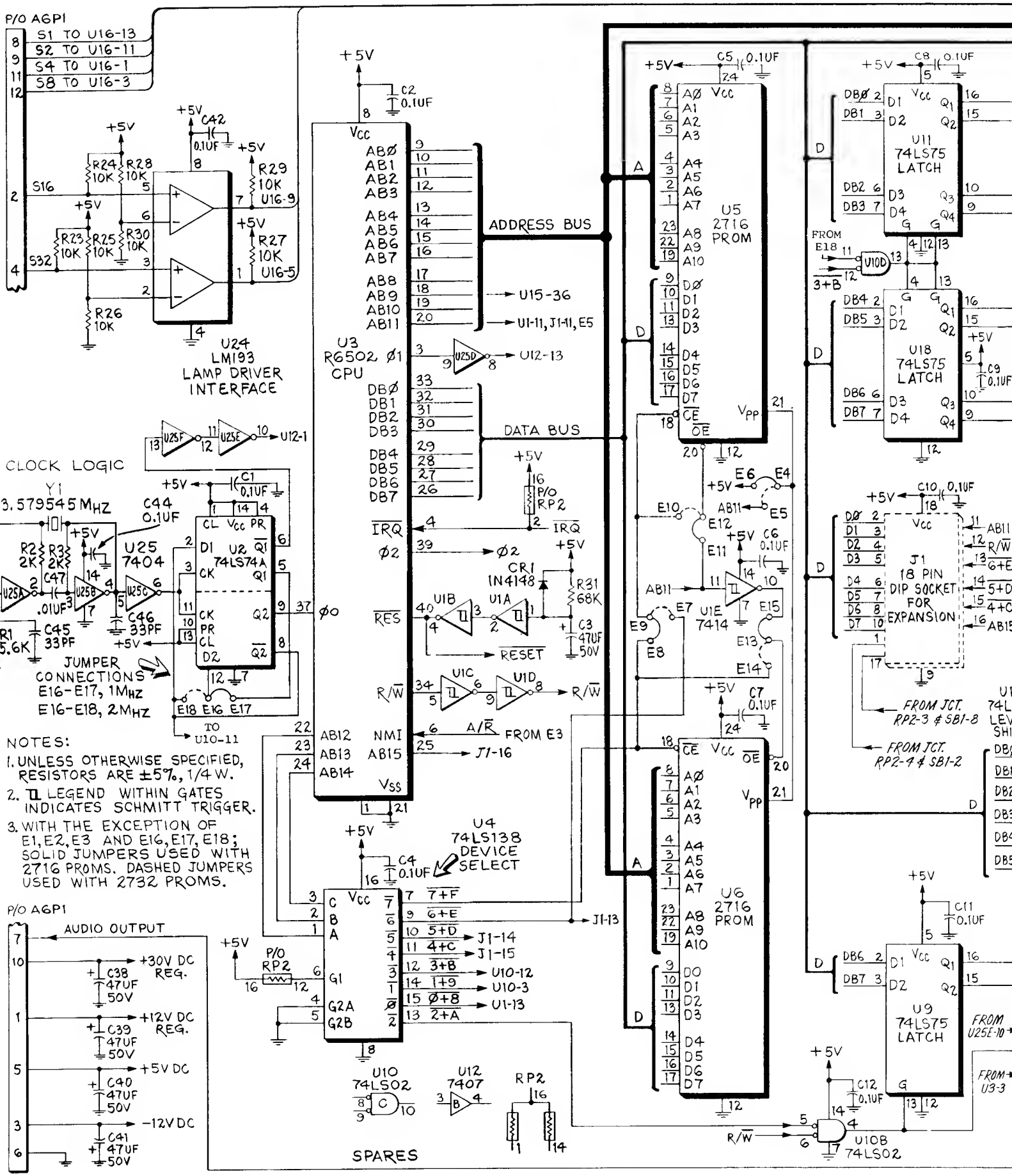
X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

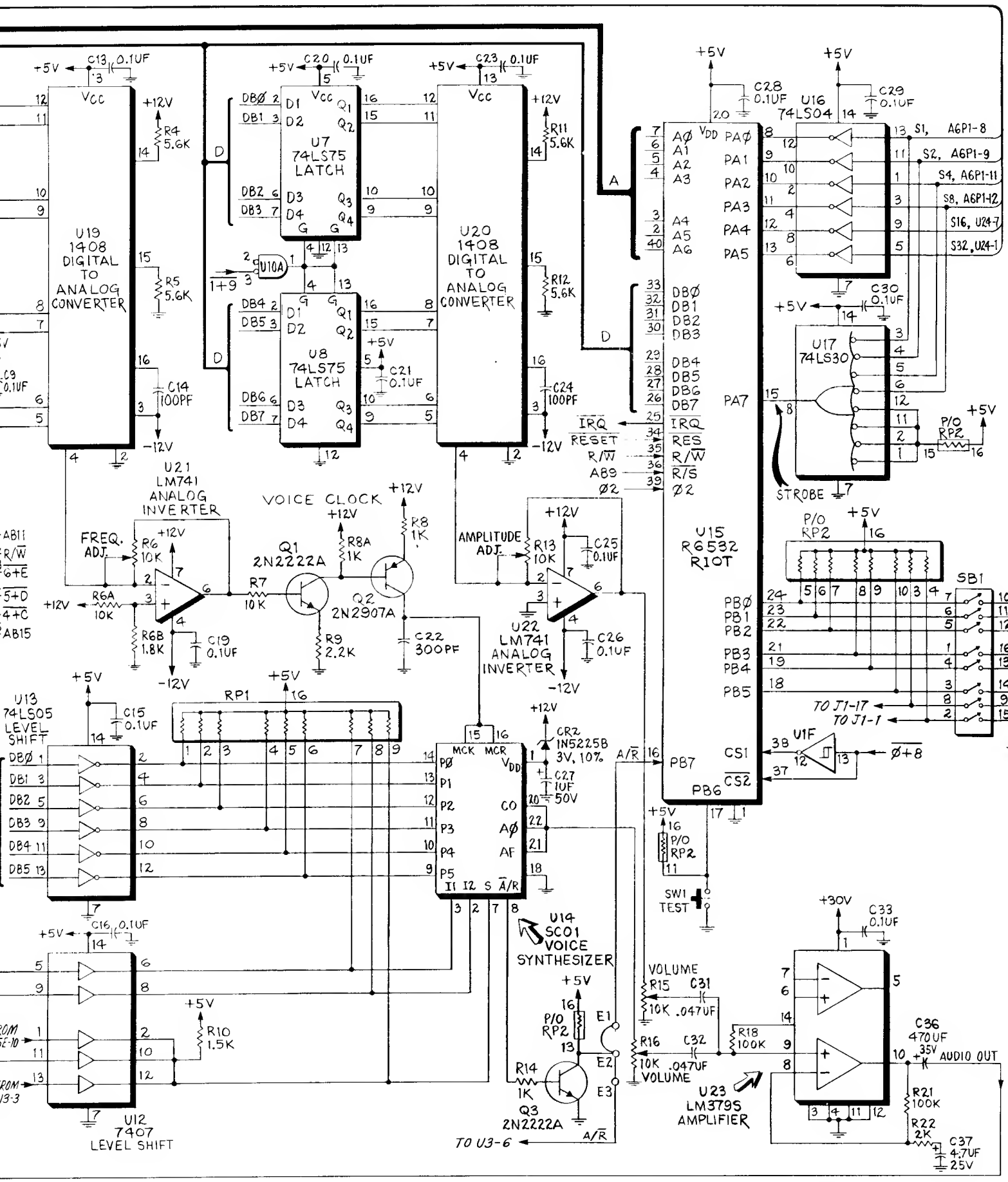
SOUND/SPEECH ASSY. (A6), COMPONENT LOCATION



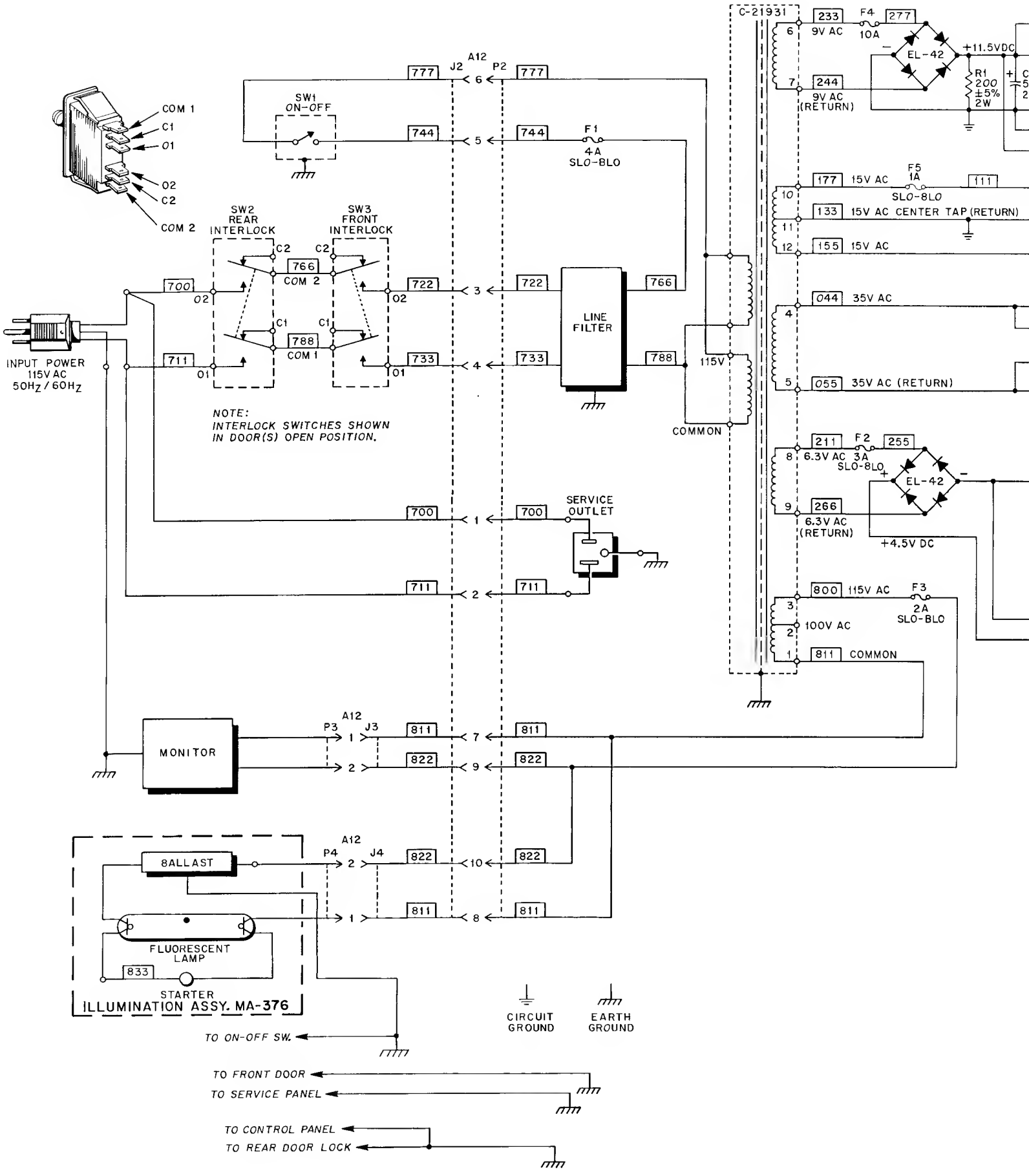
SOUND/SPEECH ASSY. (A6), PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Sound/Speech Assembly	MA-216
C1, C2	Capacitor, 0.1UF, 25V	XO-248
C4, C13		
C15, C16, C19		
C20, C21, C23		
C25, C26		
C28-C30, C33		
C42, C44		
C31-C32	Capacitor, .047UF, 25V	XO-222
C37	Capacitor, 4.7UF, 35V	XO-291
C3, C38-C41	Capacitor, 47UF, 50V	XO-210
C14, C24	Capacitor, 100PF	XO-223
C22	Capacitor, 300PF	XO-283
C27	Capacitor, 1UF, 50V	XO-217
C36	Capacitor, 470UF, 35V	XO-284
C45, C46	Capacitor, 33PF	XO-277
C47	Capacitor, .01 UF, 100V	XO-202
CR1	Diode, 1N4148	XO-261
CR2	Diode, Zener, 1N5225B	XO-269
Q1, Q3	Transistor, NPN, 2N2222A	XO-320
Q2	Transistor, PNP, 2N2907A	XO-321
R1, R4, R5 R11, R12	Resistor, 5.6K ohm, 5%, ¼W	XO-19
R2, R3	Resistor, 2K ohm, 5%, ¼W	XO-14
R6, R13	Potentiometer, 10K	XO-108
R6A, R7, R23-R30	Resistor, 10K ohm, 5%, ¼W	XO-18
R8, R8A, R14	Resistor, 1K ohm, 5%, ¼W	XO-5
R6B	Resistor, 1.8K ohm, 5%, ¼W	XO-37
R9	Resistor, 2.2K ohm, 5%, ¼W	XO-27
R10	Resistor, 1.5K ohm, 5%, ¼W	XO-20
R15, R16	Potentiometer, 10K ohm	XO-109
R18, R21	Resistor, 100K ohm, 5%, ¼W	XO-45
R22	Resistor, 2K ohm, 5%, ¼W	XO-14
R31	Resistor, 68K ohm, 5%, ¼W	XO-189
RP1, RP2	Resistor, Dip	XO-168
SB1	Switch, Dip	XO-505
SW1	Switch, Momentary Pushbutton	XO-515
U1	IC, 7414	XO-397
U2	IC, SN74LS74N	XO-434
U3	CPU, R6502-13	XO-360
U4	IC, SN74LS138N	XO-437
U5, U6	EPROM, 2716	PR-53
U7-U9, U11, U18	IC, SN74LS75	XO-394
U10	IC, SN74LS02N	XO-428
U12	IC, SN7407N	XO-384
U13	IC, Inverter, SN74LS05N	XO-411
U14	Voice Chip, SC01	XO468
U15	RRIOT, R6532-18	XO-361
U16	IC, SN74LS04N	XO-418
U17	IC, SN74LS30N	XO-432
U19, 20	Converter, PMI, 1408A-6P	XO-416
U21, U22	IC, LM741CP	XO-393
U23	IC, LM379S	XO-395
U24	IC, Dual Comparitor, LM193	XO-396
U25	Inverter, 7404	XO-402
Y1	Crystal, 3.579545MHZ	XO-456
	Socket 22 Pin Dip	XO-467
	Socket 24 Pin (2)	XO-529
	Socket 40 Pin (2)	XO-530

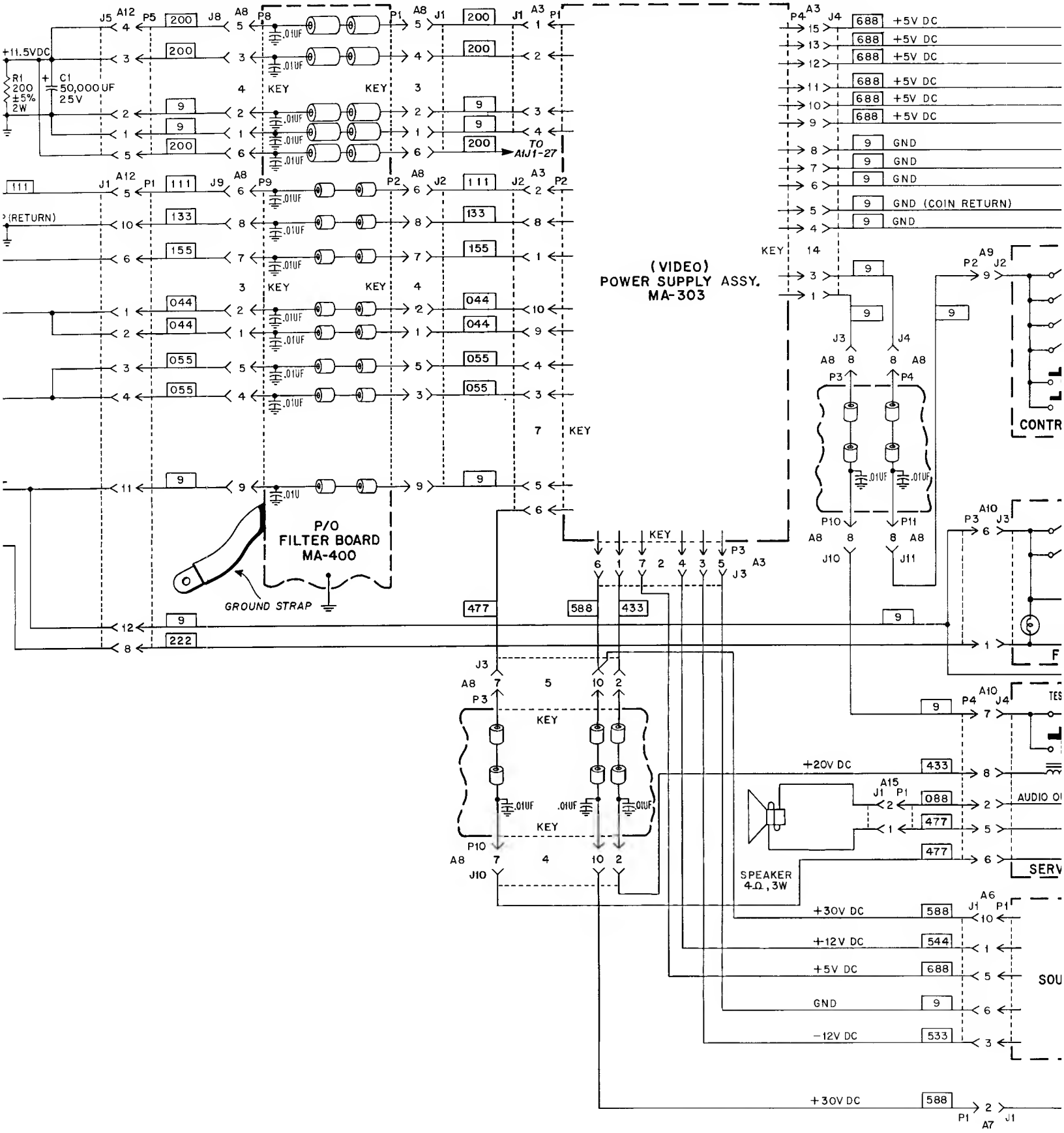

P/O A6P1
S1 TO U16-13
S2 TO U16-11
S4 TO U16-1
S8 TO U16-3
U24
LM193
LAMP DRIVER
INTERFACE
U3
R6502 Ø1
CPU
ADDRESS BUS
DATA BUS
U5
2716
PROM
U6
2716
PROM
U11
74LS75
LATCH
U18
74LS75
LATCH
U9
74LS75
LATCH
J1
18 PIN
DIP SOCKET
FOR
EXPANSION
CLOCK LOGIC
Y1
3.579545 MHZ
U25
7404
U2
74LS74A
JUMPER
CONNECTIONS
E16-E17, 1MHZ
E16-E18, 2MHZ
TO
U10-11
U4
74LS138
DEVICE
SELECT
U10
74LS02
U12
7407
RP2
SPARES
U10B
74LS02
CR1
IN4148
U1
7414
FROM JCT.
RP2-3 & SB1-8
FROM JCT.
RP2-4 & SB1-2
FROM
U25E-10
FROM
U3-3
NOTES:
1. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE ±5%, 1/4 W.
2. ⊓ LEGEND WITHIN GATES INDICATES SCHMITT TRIGGER.
3. WITH THE EXCEPTION OF E1, E2, E3 AND E16, E17, E18; SOLID JUMPERS USED WITH 2716 PROMS. DASHED JUMPERS USED WITH 2732 PROMS.
P/O A6P1
AUDIO OUTPUT
+30V DC REG.
+12V DC REG.
+5V DC
-12V DC

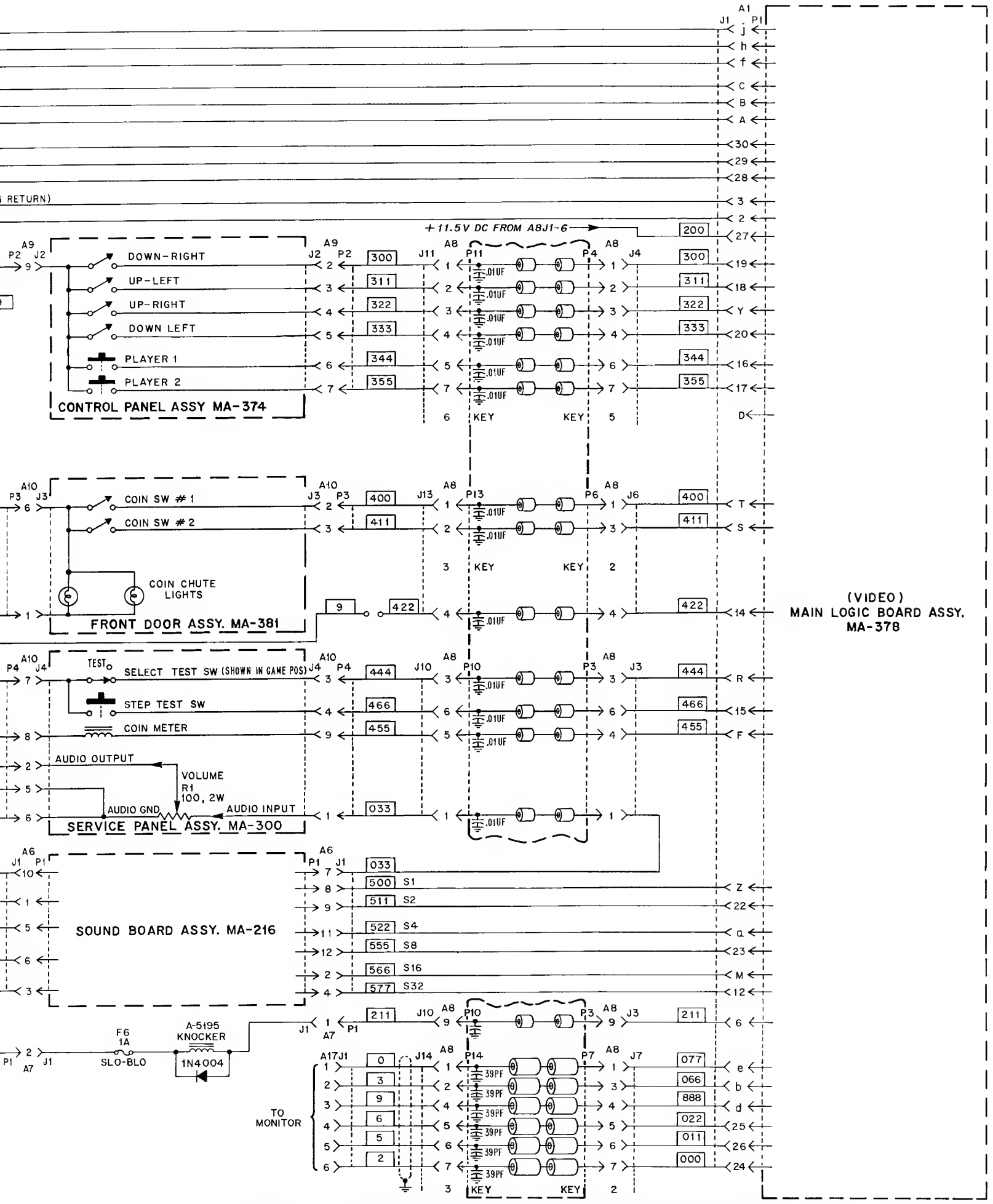


SOUND/SPEECH ASSY. (A6), SCHEMATIC DIAGRAM


C-21931
233
9V AC
F4
10A
277
EL-42
+11.5VDC
R1
200
±5%
2W
244
9V AC
(RETURN)
A12
J2
P2
777
SW1
ON-OFF
744
F1
4A
SLO-BLO
177
15V AC
F5
1A
SLO-BLO
111
133
15V AC CENTER TAP (RETURN)
155
15V AC
COM 1
C1
O1
O2
C2
COM 2
SW2
REAR
INTERLOCK
SW3
FRONT
INTERLOCK
766
700
722
788
711
733
LINE
FILTER
115V
COMMON
044
35V AC
055
35V AC (RETURN)
INPUT POWER
115V AC
50Hz / 60Hz
NOTE:
INTERLOCK SWITCHES SHOWN
IN DOOR(S) OPEN POSITION.
211
F2
6.3V AC 3A
SLO-8LO
255
EL-42
266
6.3V AC
(RETURN)
+4.5V DC
SERVICE
OUTLET
800
115V AC
F3
2A
SLO-BLO
100V AC
811
COMMON
MONITOR
P3
J3
822
8ALLAST
P4
J4
FLUORESCENT
LAMP
833
STARTER
ILLUMINATION ASSY. MA-376
CIRCUIT
GROUND
EARTH
GROUND
TO ON-OFF SW.
TO FRONT DOOR
TO SERVICE PANEL
TO CONTROL PANEL
TO REAR DOOR LOCK

X. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS





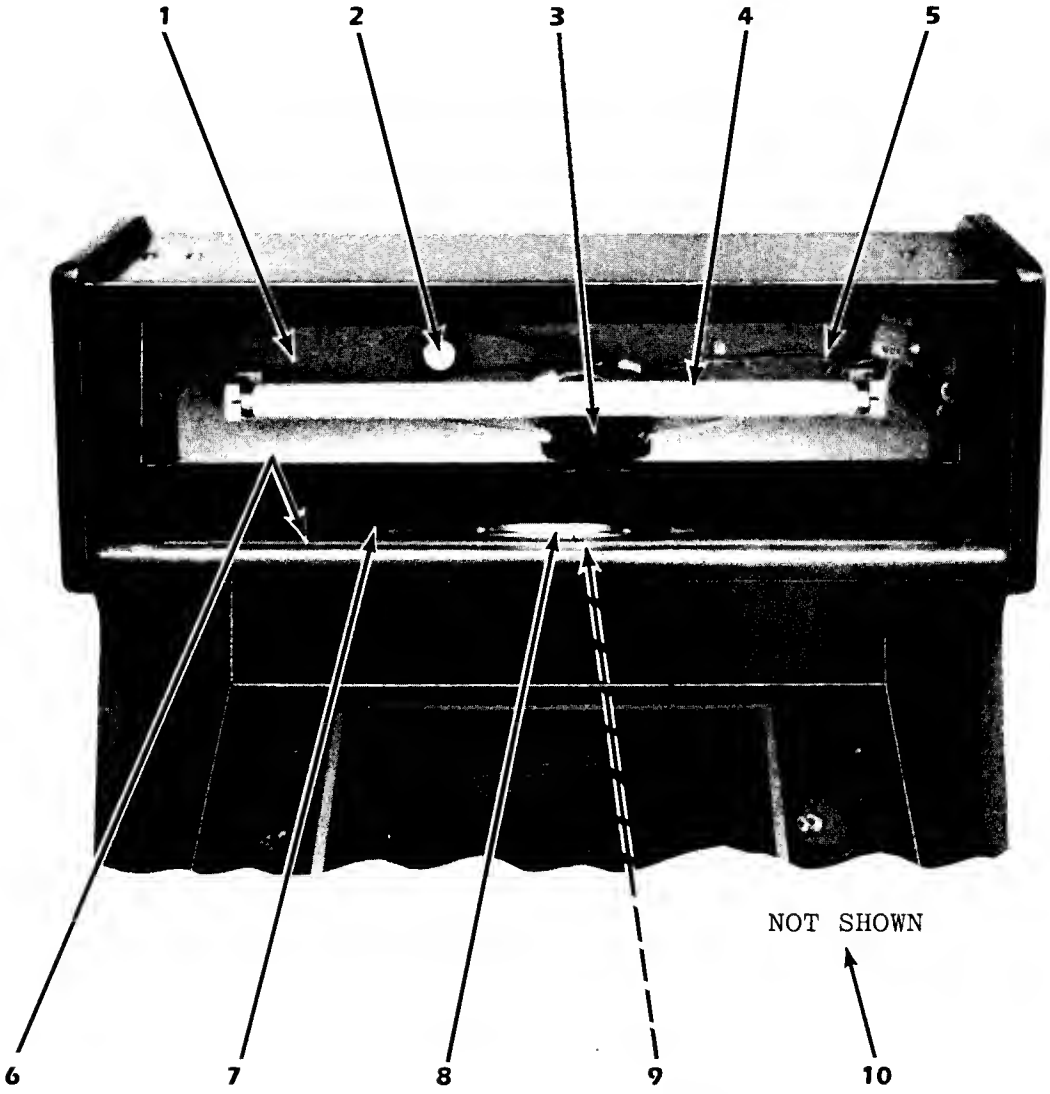
PRIMARY POWER/FILTER BOARD/INTERCONNECTION DIAGRAM

XI. PARTS INFORMATION

TABLE OF CONTENTS

XI. PARTS INFORMATION

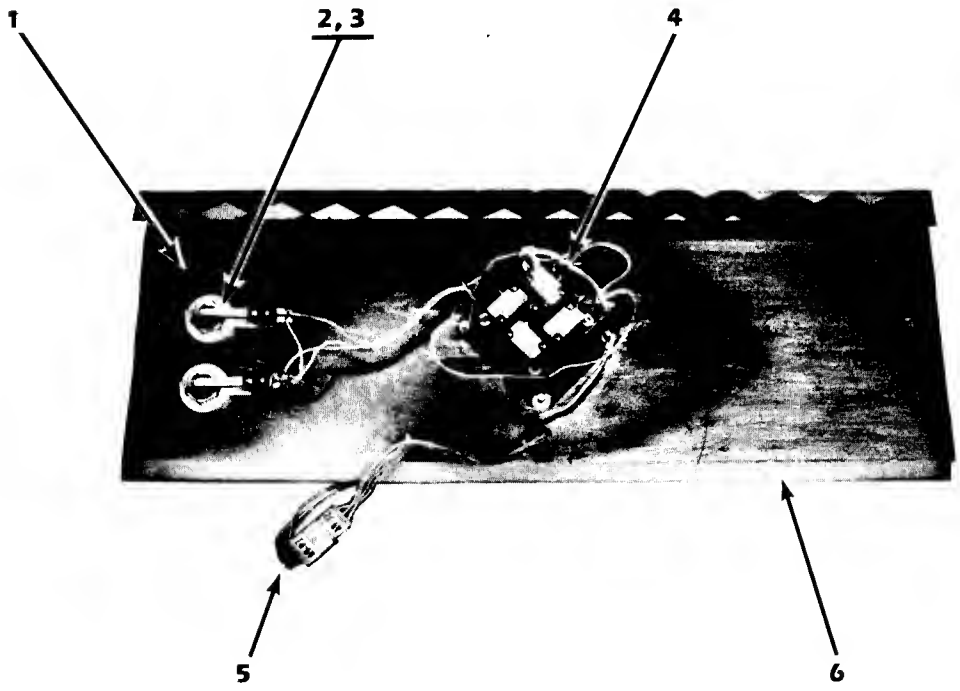
SPEAKER/MARQUEE ASSY. AND ILLUMINATION ASSY.



ITEM	DESCRIPTION	PART NO.
1.	Illumination Assy.	MA-376
2.	Starter	EL-69
3.	Ballast (60 HZ)	EL-70
4.	Lamp, Fluorescent	LA-4
5.	Cable Assy.	MA-364
6.	Speaker Assy.	MA-377
7.	Cable Assy.	MA-318
8.	Speaker	EL-83
9.	Speaker Grill	8-20931
10.	Marquee, Lexan (Screen)	DE-3

XI. PARTS INFORMATION

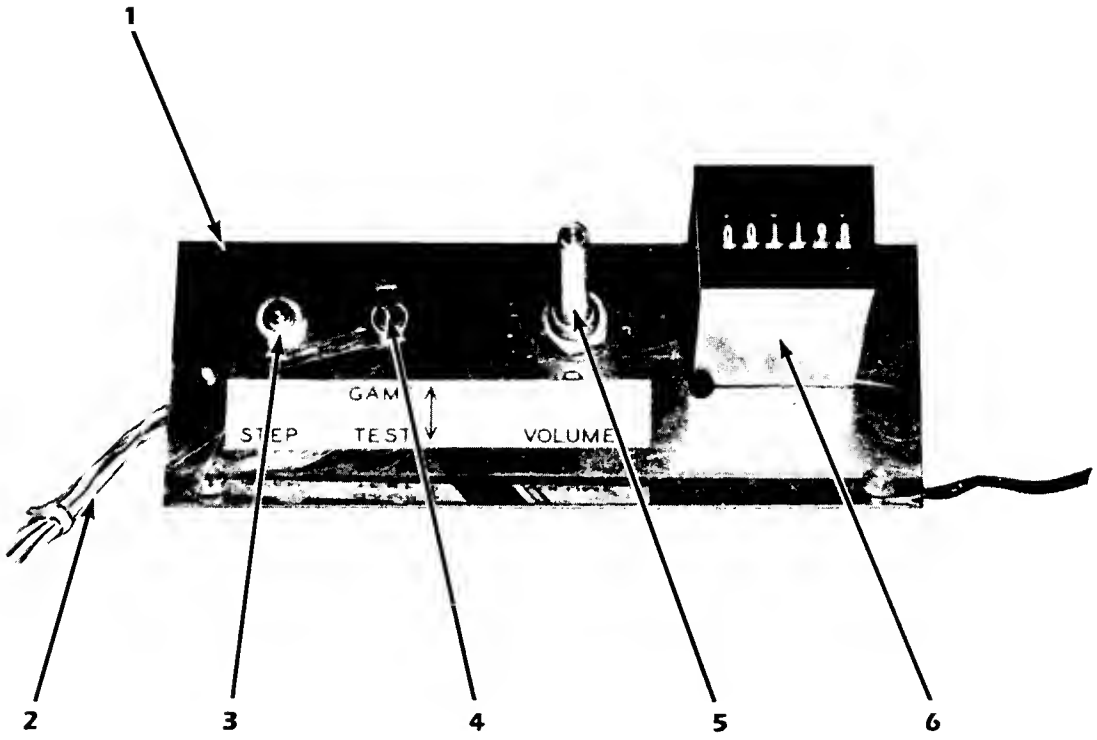
CONTROL PANEL ASSY.



ITEM	DESCRIPTION	PART NO.
1.	Control Panel Assy.	MA-374
2.	Short Button (2)	A-21970
3.	Button Holder and Switch (2)	A-21971
4.	Joystick	C-22458
5.	Cable Assy.	MA-382
6.	Lexan Overlay	DE-1

XI. PARTS INFORMATION

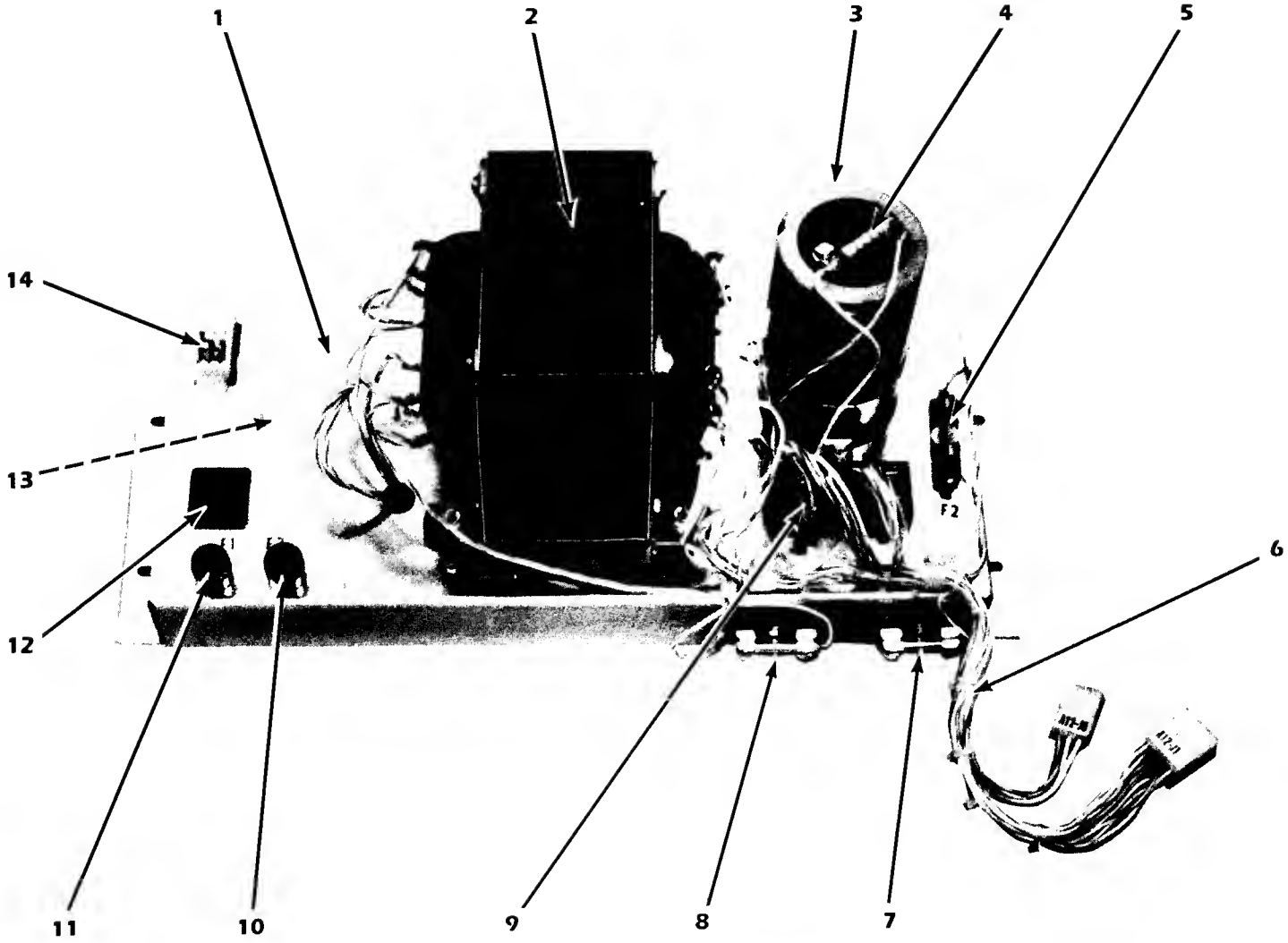
SERVICE PANEL ASSY.



ITEM	DESCRIPTION	PART NO.
1.	Service Panel Assy.	MA-300
2.	Cable Assy.	MA-316
3.	Switch (Push Button)	EL-57
4.	Switch (Toggle)	EL-85
5.	Volume Control	XO-104
6.	Coin Meter	EL-84

XI. PARTS INFORMATION

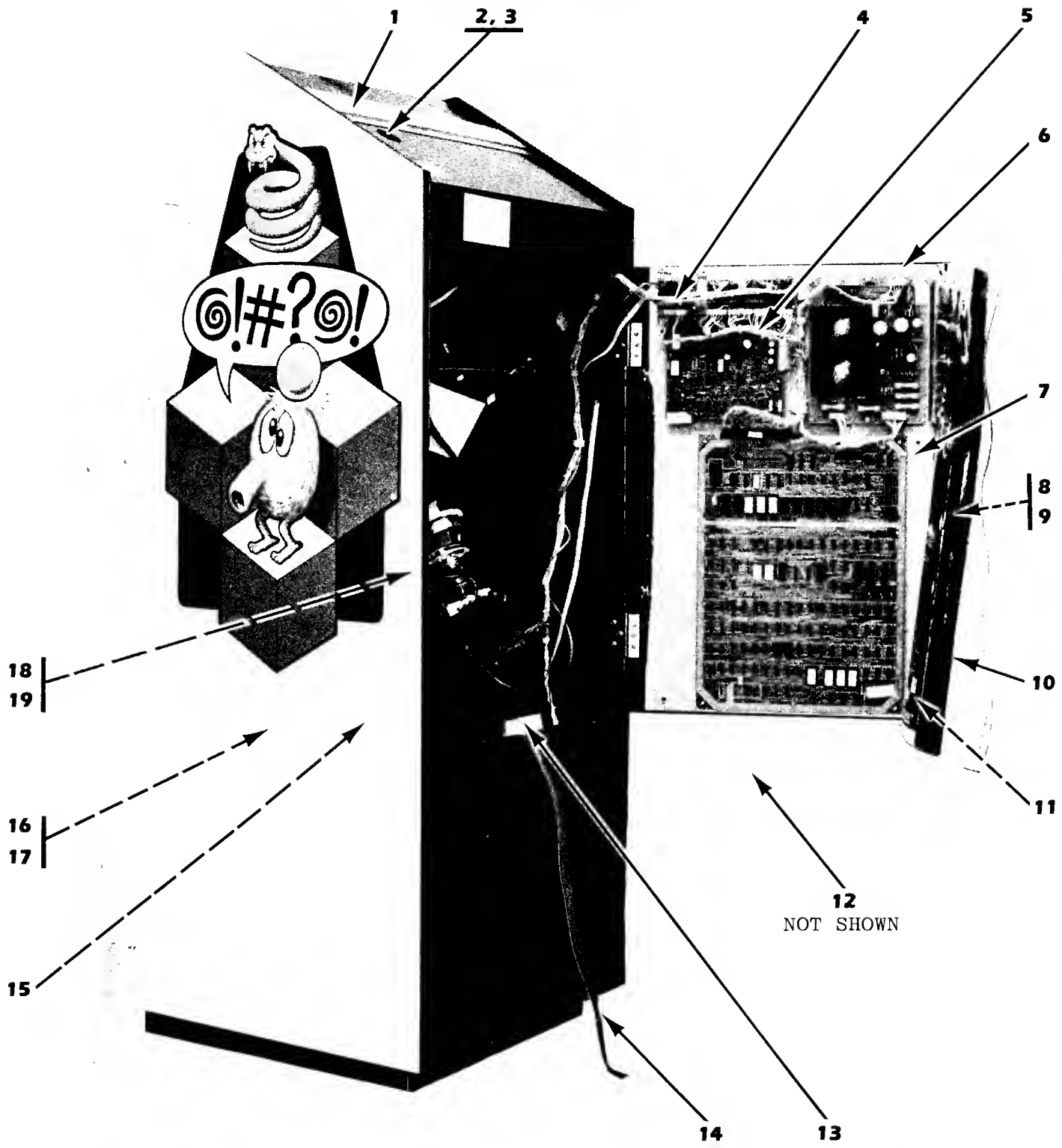
BOTTOM PANEL ASSY.



ITEM	DESCRIPTION	PART NO.
1.	Bottom Panel Assy.	MA-375
2.	Transformer	C-21931
3.	Capacitor, 50, 000UF, 25V	XO-141
4.	Resistor, 200 OHM, 5%, 2W	XO-142
5.	Fuse, 3 AMP, SLO-BLO	EL-9
6.	Cable Assy. (Secondary)	MA-314
7.	Fuse, 1 AMP, SLO-BLO	EL-6
8.	Fuse, 10 AMP	EL-23
9.	Bridge Rectifier (2)	EL-42
10.	Fuse, 2 AMP, SLO-BLO	EL-7
11.	Fuse, 4 AMP, SLO-BLO	EL-33
12.	Service Outlet	A-18133
13.	Line Filter	EL-50
14.	Cable Assy. (Primary)	MA-363

XI. PARTS INFORMATION

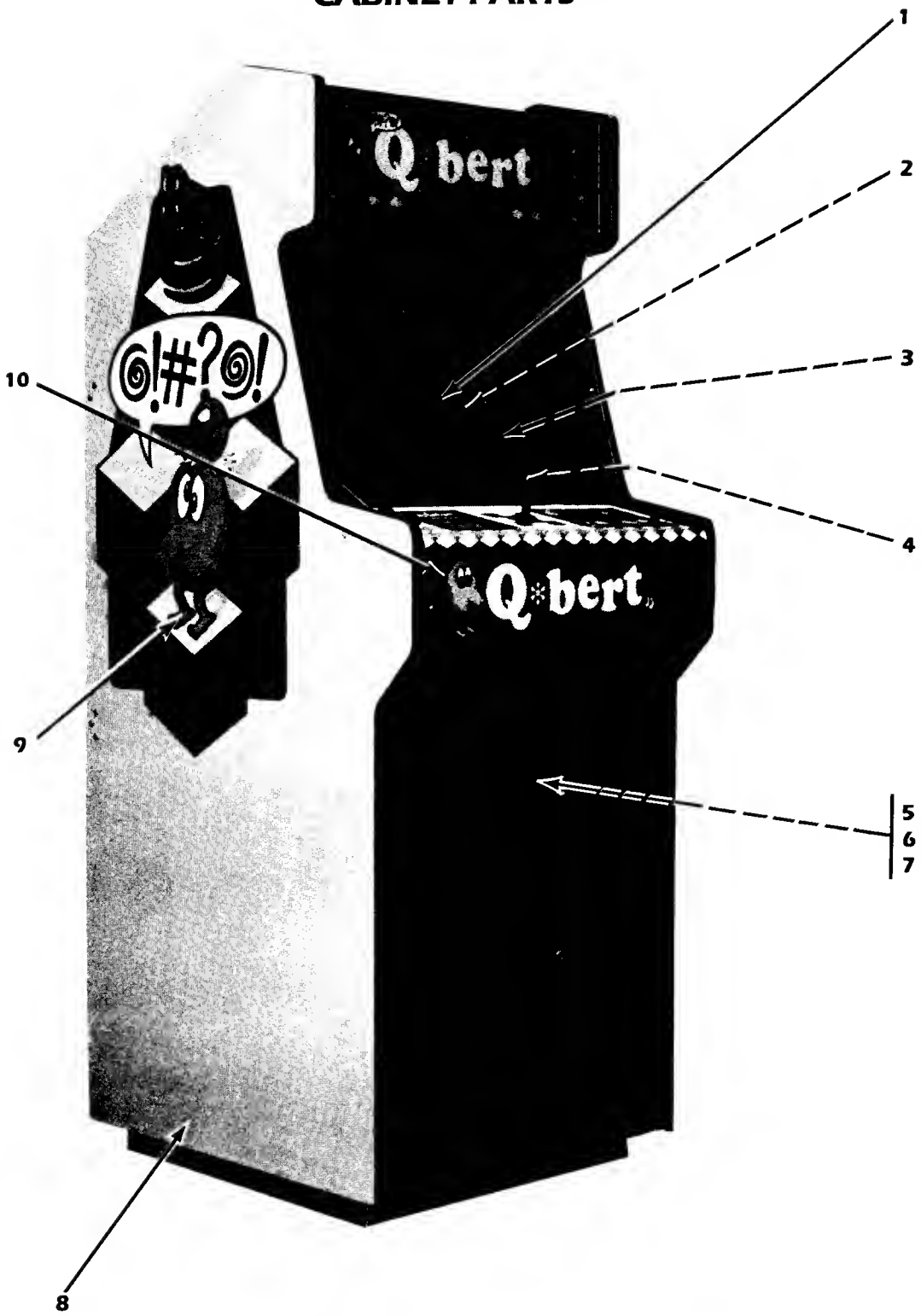
CABINET PARTS



ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.
1.	Vent Channel (1)	D-21754	11.	Shield, Bottom	C-22633
2.	On-Off Switch	EL-56	12.	Clip Bracket, Shield	B-22631
3.	Switch Plate	A-22396	13.	Line Cord	B-15357
4.	Cable Assy. Master Electronics	MA-397	14.	Cover Plate, Line Cord	A-21955
5.	Interconnect Cable	MA-398	15.	Cable Assy. High Voltage	MA-360
6	Back Door	D-21896	16.	Knocker Assy.	MA-384
7.	Master Electronic Board	MA-394	17.	Fuse, 1 AMP, SLO-BLO	EL-6
8	Rear Door Lock	MH-0	18.	Interlock Switch	EL-66
9	Anchor Plate, Lock	MH-1	19.	Cover, Interlock Switch	A-21888
10.	Shield, Top	C-22632			

XI. PARTS INFORMATION

CABINET PARTS



ITEM	DESCRIPTION	PART NO.	ITEM	DESCRIPTION	PART NO.
1.	Top Glass (Screened)	SG-1	7.	Cover, Interlock Switch	A-21888
2.	Monitor Filter Glass	D-22465	8.	3" Leg Adjuster (2)	MH-21
3.	Monitor Mask	D-22463	9.	Decal (Right)	DE-4
4.	Monitor	C-22462		Decal (Left)	DE-4
5.	Cable Assy., Front Door	MA-365	10.	Lexan Overlay (Screen)	DE-2
6.	Interlock Switch	EL-66			

LIMITED WARRANTY

D. Gottlieb & Co. warrants to the initial purchaser of the D Gottlieb & Co machine that the items listed in the following schedule as installed and used in the original D. Gottlieb & Co. machine will for the applicable period set forth in the schedule, computed from the initial date of purchase from an authorized D Gottlieb & Co. distributor, be free of defects in materials and workmanship

SCHEDULE

GAME	ITEM	WARRANTY PERIOD
Pinball	All Electronic Printed circuit boards	90 days
Pinball-Video	All Electronic Printed Circuit Boards	90 days
	Card Cage	90 days
	Television Monitor	30 days
Video	All Electronic Printed Circuit Boards	90 days
	Television Monitor	30 days

This Limited Warranty does not apply to any parts damaged in the course of handling or assembling by the customer or damage due to other than normal use or use in violation of instructions or reasonable practices, or further damaged in return shipment. This Limited Warranty is made only to the original customer, and is and shall be in lieu of all other warranties expressed or implied, and of all other obligations or liabilities on the part of D. Gottlieb & Co. and in no event shall D. Gottlieb & Co. be liable for any anticipated profits, consequential damages, loss of time, or other losses incurred by the customer in connection with the purchase or operation of D. Gottlieb & Co. machines or components thereof

The registration card with each D Gottlieb & Co. factory-wired machine must be filled in and returned to D. Gottlieb & Co. within ten days after date of purchase for this Limited Warranty to be effective. This Limited Warranty applies only to machines so registered

THIS LIMITED WARRANTY IS IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, AND OF ANY OTHER OBLIGATION ON THE PART OF THE SELLER AND D GOTTLIEB & CO.

Gottlieb™
AMUSEMENT GAMES